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DECEMBER 1946



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DECEMBER, 1946

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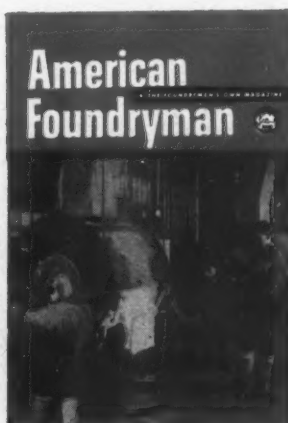
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The American Foundrymen's Association is not responsible for statements or opinions advanced by authors of papers printed in its publication.

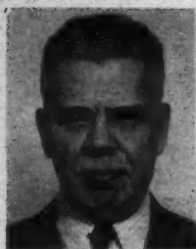
This Month's Cover

Brass foundry melting . . . in two-shift operation, each 2200 ampere fully automatic electric furnace in the battery of four melts over 5 tons of metal . . . 225 pounds of metal poured every 3½ minutes.

Photo courtesy H. B. Salter Mfg. Co., Marysville, Ohio

Published monthly by the American Foundrymen's Association, Inc., 222 W. Adams St., Chicago 6. Subscription price, to members, \$4.00 per year; to non-members, \$6.00 per year. Single copies, 50c. Entered as second class matter July 22, 1938, under the Act of March 3, 1879, at the post office, Chicago, Illinois. Additional entry at Omaha, Neb.

★ DECEMBER WHO'S WHO ★



L. J. Larson

The author of *Heavy Gray Iron Castings Welding*, L. J. Larson was born in Minnesota, town of Heron Lake . . . Obtained his Bachelor of Science and civil engineering degrees from University of Minnesota, Minneapolis

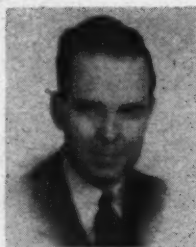
. . . Later he was awarded his Master of Science degree from University of Illinois, Urbana . . . From 1917-19 was engineer-physicist, Bureau of Standards, Washington, D. C. . . Was a faculty member, College of Engineering, University of Illinois, 1920-26 . . . For eleven years (1927-38) was associated with A. O. Smith Corp., Milwaukee, in charge and director of welding research . . . Entered private practice as a consulting welding engineer in 1938 with his offices in Milwaukee . . . In 1942 he became connected with Allis-Chalmers Mfg. Co., Milwaukee, as welding engineer . . . Memberships include ASM, ASTM, ASCE and AWS.



P. C. Rosenthal

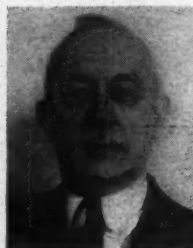
From the Badger state comes P. C. Rosenthal . . . Born in the city of West Allis . . . A graduate of the University of Wisconsin, Madison, with a Bachelor of Science degree in metallurgical engineering . . . A member of the class of '35 . . . Associated with Battelle Memorial Institute, Columbus, Ohio, for 2½ years as research engineer working on process metallurgy problems . . . Returned to the University of Wisconsin as an instructor in metallurgy . . . Received a Master of Science degree in 1939 and continued with graduate work while teaching . . . In 1941 accepted a position as assistant supervisor in process metallurgy at Battelle and remained there until the end of 1945 . . . Assumed the position of associate professor of metallurgy, University of Wisconsin, in 1946 . . . Co-author of papers dealing

with malleable iron, cast steel and related subjects . . . Contributor, with J. G. Kura, in this issue, of *Cast Steel, Homogenization Heat Treatments*.



B. L. Simpson

National Director Bruce L. Simpson was born in Chicago . . . Attended both Hobart College, Geneva, N. Y., and Northwestern University, Evanston, Ill. . . . Obtained his degree from the latter in 1934 and two years later was awarded an LL.B. from Northwestern Law School . . . Admitted to the bar in 1937 . . . Severed his legal connections to become purchasing agent, National Engineering Co., Chicago . . . Was appointed vice-president in charge of operations and in 1942 became president of the above concern . . . Is a director of the Foundry Equipment Manufacturers Association and has held positions of director, secretary and treasurer of the A.F.A. Chicago chapter . . . Has spoken before a number of A.F.A. chapters on the history of the castings industry . . . Mr. Simpson, whose article *Castings Industry Needs Vocationally Competent Men* appears in this issue, is an A.F.A. and American Chemical Society member.



A. I. Krynsky

Molding Sand, Fineness Test, written jointly by A. I. Krynsky and Margaret Price is the result of a study conducted at National Bureau of Standards, Washington, D. C. . . . Mr. Krynsky was born in Russia and received his education in the military schools of the old regime . . . Specializing in metallurgy, he studied under the well known Professor Techernoff . . . From 1907-1915 was superintendent, metallurgical department,

government time fuse plant, St. Petersburg, Russia . . . Sent to this country by the Russian government in 1915, he was made chief inspector of time fuses ordered by his government . . . Following the governmental change, Mr. Krynsky remained in this country and since 1918 has occupied various positions with the National Bureau of Standards . . . At present is chief of experimental foundry . . . Mr. Krynsky has contributed a number of papers at previous A.F.A. conventions on the general subject of test bars and other subjects . . . A member of American Foundrymen's Association.



J. G. Kura

The heat treatment of cast steel is covered in a paper written by J. G. Kura and P. C. Rosenthal . . . Appearing in this issue the results of this study is published as *Cast Steel, Homogenization Heat Treatments* . . . Mr. Kura was born in Pittsburgh . . . Received his diploma in 1938, graduating from Carnegie Institute of Technology, Pittsburgh, with a Bachelor of Science degree in metallurgical engineering . . . Upon graduating became connected with Carnegie-Illinois Steel Corp., Duquesne works, Duquesne, Pa. . . . In 1941 joined the staff at Battelle Memorial Institute, Columbus, Ohio, as research engineer.



A. C. Schmid

Arthur C. Schmid, born in Carlstadt, N. J., has made a special study of combustion problems . . . In this issue discusses *Crucible Furnace Melting, Combustion Factors* . . . From 1925-44 was field engineer, Chas. Englehard, Inc., Newark, N. J., covering sales, ap-

AMERICAN FOUNDRYMAN

plication and servicing of industrial instruments . . . Joined the staff of Joseph Dixon Crucible Co., Jersey City, N. J., in 1944 as sales engineer . . . Has written a number of articles on combustion.

Margaret Price, co-author with A. I. Krynsky of the paper *Molding Sand, Fineness Test*, is the first woman to appear in this section of AMERICAN FOUNDRYMAN . . . Miss Price was born in West Virginia . . .



Margaret Price

A graduate of the University of Maryland, College Park, with a Bachelor of Science degree (1943) . . . Became affiliated with the sand laboratory, division of metallurgy, National Bureau of Standards, Washington, D. C., upon graduating from college.

NEXT MONTH

Among the outstanding and valuable technical papers in the January issue of AMERICAN FOUNDRYMAN will be discussions of: unsoundness in cast light alloys, the result of a project sponsored by the A.F.A. Committee on Shrinkage and Porosity, Aluminum and Magnesium Division; properties and applications of foundry refractories by C. A. Brashares, Harbison-Walker Refractories Co., Pittsburgh, Pa.; and bore cracks in cast steel valves and fittings by H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., and H. F. Bishop and W. H. Johnson, Naval Research Laboratory, Washington, D. C.

51st A.F.A. CONVENTION DETROIT IN '47

DECEMBER, 1946

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HOW ENGINEERS SERVE THE FOUNDRY INDUSTRY

GRAY IRON FOUNDRIES have had a rather bitter drink to swallow in a cocktail made up of large portions of coke, scrap and pig iron shortages, at a time when demand for castings has increased to the point where capacities of the foundries are strained to the utmost. In facing its problems, the industry will find that the A.F.A. Gray Iron Division has provided timely and valuable assistance.

The shortages of these materials necessitate the most economic utilization of coke, scrap and pig iron. Invaluable help in this regard is provided, in concrete recommendations on operational procedures, by the *HANDBOOK OF CUPOLA OPERATION*. This book, prepared for the use and reference of operators, is the culmination of the first phase of the broad program of the Division's Cupola Research Committee. That group is now preparing to undertake new researches to fill in the gaps of our knowledge on cupola operation, and provide further practical assistance to the industry.

As another aid to economic production of gray iron castings, the Division's Welding Committee presented, at the Golden Jubilee Convention of the Association, a symposium on welding of gray iron. The data made available through this symposium should enable salvage of many castings which would otherwise be scrapped, and help overcome a hesitancy to use welded gray iron.

Aid to more efficient operation is also provided in a comprehensive study of casting defects and their causes, recently completed by the Casting Defects Committee of the Division. This work, soon to be published, will certainly be most helpful in production of sound castings.

Recognizing that the above activities do not complete-

ly cover the problems of gray iron foundrymen, the Division recently appointed committees to study heat treatment, section size relationship and cleaning of gray iron castings. These phases of the Division's activities are designed to supply practical operating information for the workmen themselves.

Metallurgists and design engineers constantly demand more information on the metallurgy and physical properties of gray iron. A valuable reference work, in response to this demand, will be available in the near future with publication of a symposium on engineering properties of gray iron. This work was initially presented at the Golden Jubilee Convention.

The Division is well aware, however, that a great number of problems still require attention, and its committees are actively engaged in studies on test bar design, chill tests, microstructure, and many other subjects of importance to the field.

The Gray Iron Division exists for the purpose of helping foundries interested in gray iron and its manufacture. Suggestions and criticisms are always welcome, since they indicate the direction in which the Division can best serve the A.F.A. membership.

Thomas E. Eagan

T. E. EAGAN, Chairman,
A.F.A. GRAY IRON DIVISION

T. E. EAGAN, Chairman, Gray Iron Division, is chief metallurgist, The Cooper-Bessemer Corp., Grove City, Pa. Holds degrees from Columbia University, New York City, and Missouri School of Mines, Rolla, Mo. A frequent writer for the trade press and active in such technical organizations as A.F.A., AIME, ASM, ASTM and SAE.



A.F.A. ANNUAL LECTURE WILL HONOR C. E. HOYT

BY UNANIMOUS ACTION of the Executive Committee of the A.F.A. Board of Directors, on recommendation of the Annual Lecture Committee, the former annual Foundation Lecture henceforth will be known as the Charles Edgar Hoyt Annual Lecture. Thus A.F.A. gives further deserved recognition to "Ed" Hoyt, who has been closely identified with its progress and accomplishments over a period of nearly thirty years.

When "Ed" Hoyt first became an elected staff officer of the Association in 1918, as Secretary-Treasurer, membership totaled 1072. As Secretary, Treasurer, Manager of Exhibits, and Executive Vice-President, he was largely responsible for the sustained growth and prestige of A.F.A., and on his retirement August 1, 1946, he saw its world-wide membership top a new record of 8800. (Today it exceeds 9000.)

Stimulated Industry's Advance

Probably more than any other living man of the industry, C. E. Hoyt played a large part in developing the foundry industry's own recognition of its possibilities for progress. He staged one of the first foundry equipment and supplies exhibits in 1906, and every such exhibit thereafter for nearly forty years. These exhibits, and A.F.A. convention programs, greatly encouraged development of improved foundry methods and materials and equipment, stimulated castings problem research, and led to the great progress of the industry during the past quarter century.

For his services to A.F.A. and the

industry, he received the Association's Joseph S. Seaman Gold Medal and Honorary Membership at the 1941 Convention.

Directors Inaugurate Series

In 1942 the lecture was designated the Foundation Lecture, and the first in that series was presented at the St. Louis meeting in 1943 by John W. Bolton, The Lunkenseimer Co., Cincinnati. His subject was "Foundry Metallurgy in the Castings Industry." Due to the splendid reception given that address, which discussed metallurgy in general and understandable terms, all lecturers since then have been widely recognized technologists.

The history of the annual lectures, first presented in 1938, makes logical the new choice of name. In that year the Board of Directors decided to inaugurate at each foundry convention an annual address by an outstanding man of industry. The subject matter, not necessarily technical, was to be of a nature to add to the knowledge and information of foundrymen. Selection of the lecturer was delegated to the Board of Awards, and C. R. Hook, President of American Rolling Mill Co., Middletown, Ohio, delivered the first address, known then as the "Awards Lecture," at the Cleveland Convention in 1938.

In 1944, at Buffalo, Dr. H. W. Gillett, Battelle Memorial Institute, Columbus, lectured on "Cupola Raw Materials;" the 1945 lecturer was Dr. H. A. Schwartz, National Malleable & Steel Castings Co., Cleveland, whose address on "Solidifica-

tion of Metals" could not be delivered in person when the scheduled Detroit convention of that year became a war casualty; in 1946, at the 50th Anniversary Convention in Cleveland, Dr. G. H. Clamer, Ajax Metal Co., Philadelphia, presented a treatise on "Test Bars for 85 Copper, 5 Tin, 5 Lead, 5 Zinc Alloy—Design and Some Factors Affecting Their Properties."

The first Charles Edgar Hoyt Annual Lecture will be presented at the 1947 convention of the Association in Detroit.

"The objective of the Association is to encourage the assembly of technical information and to disseminate it—to promote improvements in products and processes, and to see that the engineering world has placed before it reliable and complete information."

J. W. Bolton

"Getting a uniform product from the cupola . . . is an art, rather than a science . . . It will soon be time to look to cupola raw materials and try to control them to a degree consistent with the perfect castings you will make tomorrow when you fully utilize the accumulated knowledge that has been piled up by decades of A.F.A. effort."

H. W. Gillett

J. T. MACKENZIE TO BE FIRST HOYT LECTURER



DR. JAMES T. MACKENZIE, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala., has been invited by the Association's Annual Lecture Committee to deliver the 1947 Charles Edgar Hoyt Annual Lecture at the business session of the 51st Annual Meeting in Detroit, April 28-May 1. Dr. MacKenzie will discuss "The Cupola Furnace."

Selection of Dr. MacKenzie maintains the tradition of securing an outstanding foundry technologist to deliver the important technical dis-

cussion to the A.F.A. membership.

Dr. MacKenzie, long known as an outstanding gray iron technologist, is eminently qualified to prepare such a technical paper for presentation at the annual gathering of the Association.

A member of the American Foundrymen's Association since 1921, Dr. MacKenzie was the author of the Association's exchange papers to the Institute of British Foundrymen in 1927 and 1938; served as Chairman of the Gray Iron Division in 1936 and 1937, and was honored with the John H. Whiting Gold Medal of A.F.A. in 1938. He represents A.F.A. on a number of joint committees and on the Ferrous Metals Committee, advisory to the National Bureau of Standards.

Dr. MacKenzie is also prominently active in a number of other technical societies. Member of the American Institute of Mining and Metallurgical Engineers since 1924, he served as Chairman of its Iron and Steel Division in 1937-38, as a Director in 1939-42 and was honored by being invited to deliver the Howe Memorial Lecture in 1944.

An active member of the American Chemical Society for many years, he has served as secretary and as councilor of the Alabama Section, and is currently a candidate for national councilor-at-large. Over a long association with the American Society for Testing Materials, Dr. MacKenzie has served on the board of directors of that organization and is Chairman of its Committee A-3 on Cast Iron.

He is serving his third term as

Chairman, Electrothermic Division, Electrochemical Society, and also holds membership in the American Society of Metals, American Ceramic Society, Society of Automotive Engineers, National Association of Corrosion Engineers, American Petroleum Institute, Society for Experimental Stress Analysis, American Water Works Association, American Gas Association, American Welding Society, Iron and Steel Institute of Great Britain and the Association Technique De Fonderie de France.

Reported on German Science

Dr. MacKenzie made a study of German centrifugal casting methods on a mission for the Federal Foreign Economic Administration in 1945, and prepared a report on his observations which has received wide attention. He is author of many outstanding technical papers for A.F.A. and other societies.

A native of Florida, Dr. MacKenzie received his technical education at the University of the South, Sewanee, Tenn., where he received the degrees of B.C.E. and M.A. In 1930, he was awarded an honorary D.Sc. by the University, and was elected a member of its Board of Trustees in June this year.

Joining American Cast Iron Pipe Co. as an analyst in 1912, he was engaged in research from 1914 to 1915, later served as chief chemist and metallurgist until 1940, when he assumed his present position.

For a relaxing hobby, Dr. MacKenzie turns to music, and is known as an accomplished organist.

"We live by pouring liquid metal into the molds and selling the solidified object to the customer . . . The foundryman must be concerned with the question of producing a frozen piece of metal having a desired form, free from injurious voids, and of a microstructure and macrostructure consistent with certain desired physical properties."

H. A. Schwartz

"The millenium whereby a single test-bar value becomes a reliable barometer of casting quality has definitely not been, and may never be, reached . . . The test bar can be a barometer of casting quality only insofar as the properties or serviceability of the castings are dependent upon melt quality."

G. H. Clamer

MOLDING SAND

FINENESS TEST

Margaret Price
and

A. I. Krynitsky
National Bureau of Standards
Washington, D. C.

AT THE PRESENT TIME the accepted test for evaluating the clay substance in a molding sand is the American Foundrymen's Association standard sedimentation method. This test is of limited value because the definition of clay substance as a material composed of particles less than 20 microns is purely arbitrary. In addition, the test yields no information on the distribution of the subsieve particles contained in the sand. These limitations are recognized by the A.F.A. and, according to the **FOUNDRY SAND TESTING HANDBOOK**¹, this method "has as its principal defect the inability to separate fine silt from true clay. This accounts for the fact that two sands with the same A.F.A. clay content may have different properties."

Morey and Taylor² have ably demonstrated that the present A.F.A. method does not give an adequate evaluation of molding sand.

As far as it is known to the authors the first contribution on the subject of determining the size distribution of the subsieve particles in molding sand was presented by Jackson and Saeger³. In their pioneer work they used a pipette method and showed that this method

was readily adaptable to the determination of the fineness of molding sand. The objective of the present investigation was to compare three different methods of making fineness determinations on molding sands.

Albany and Lumberton molding sands were employed in this investigation. The samples were thoroughly mixed, riddled, mulled at a low moisture content, and stored in mason jars prior to use. The specific gravities of the sands were determined by the standard method for specific gravity of soil⁴. The average values for the specific gravities of Albany and Lumberton sands were found to be 2.698 and 2.676, respectively. The sands tested were dispersed in distilled water and a sodium hydroxide solution used as a deflocculating agent.

Methods and Results

The essential principle of the fineness test methods used in this investigation is sedimentation. When solid particles of various sizes are dispersed in a liquid medium and then allowed to settle free-

ly, a definite relationship exists between the diameter of the particles, the density of the particles, the density of the liquid, the viscosity of the liquid, and the distance that each particle settles in unit time. This relationship is expressed mathematically by Stokes' law which may be written:

$$d = \sqrt{\frac{30 nL}{980(G - G_1)T}}$$

where

d = maximum diameter of particle in millimeters,

n = coefficient of viscosity of the suspending medium in poises (varies with changes in temperature of the suspending medium),

L = depth of settling in centimeters.

T = time in minutes (period of sedimentation),

G = specific gravity of sand particles,

G₁ = specific gravity of the suspending medium.

Although Stokes' law applies particularly to spherical particles, An-

► It is recognized that the present American Foundrymen's Association sand fineness test method is not entirely satisfactory since sands with the same A.F.A. classification may have different properties. In view of this fact other methods have been proposed, but little has been published on this subject. The present investigation was prompted by the need for more data, the primary purpose being to evaluate the merits of the ordinary pipette, the Andreasen pipette, and the hydrometer methods in making fineness determinations on Albany and Lumberton molding sands. The hydrometer method, which is described in detail, was found to be preferable because it yields satisfactory results conveniently in a minimum of time.

¹Presented at a Sand Research Session of the Fiftieth Annual Meeting, American Foundrymen's Association, at Cleveland, May 8, 1946.

Table 1
RESULTS OF THE REGULAR PIPETTE TEST ON LUMBERTON SAND

Temperature, C	Viscosity of water in poises	Time, min	Diameter "d" in microns		W ₁ grams	W ₁ -0.0095, grams	P, %	100-P, %
			Read from nomograph	Corrected according to sp gr of sand				
28	0.0084	2	31.8	31.5	0.2672	0.2577	20.6	79.4
28	0.0084	5	20.0	19.8	0.2509	0.2414	19.3	80.7
28	0.0084	15	11.5	11.4	0.2365	0.2270	18.2	81.8
28	0.0084	30	8.2	8.1	0.2314	0.2219	17.7	82.3
27	0.0085	60	5.8	5.7	0.2243	0.2148	17.2	82.8
27	0.0085	250	2.9	2.9	0.2152	0.2057	16.4	83.6
27	0.0085	1440	1.2	1.2	0.2081	0.1986	15.9	84.1

dreasen⁶ has shown that it can be applied to angular or cubical particles of the same weight.

Regular pipette, Andreasen pipette, and hydrometer methods were employed in this investigation.

Pipette Method. When solid particles of various sizes are dispersed in a liquid medium and then allowed to settle freely, the relative distances that individual particles will settle in a fixed time depends upon their size provided that the particles are of the same density and the temperature remains constant. If a sample is taken after a stated time from a specified level, the concentration of the solid particles in the sample will be less than the original concentration by the weight of the larger particles that have settled out of the test zone. The maximum particle size present in the sample can be calculated with the aid of the Stokes formula and, if several samples are taken at suitable time intervals, data may be obtained for plotting a particle size distribution curve for the material undergoing test.

Regular Pipette Method. This method was used by Jackson and Saeger³ and has been described in detail in their paper.

Test Procedure

Experimental Details. A 50-gram sample of oven-dried sand was placed in a 1-qt. mason jar with 25 ml of one per cent sodium hydroxide solution and 475 ml distilled water and dispersed for 5 min. with an electric stirrer equipped with vertical baffles. The mixture was then transferred into a 1-liter cylinder by repeated washings with distilled water. Additional distilled water was added to bring the volume of the suspension up to 1 liter. The mixture was

shaken thoroughly for 1 min. and the cylinder placed on a level surface to allow uniform undisturbed settling. A stop watch was immediately started and samples were withdrawn at intervals of 2, 5, 15, 30, 60, 250, and 1440 min. The tip of the pipette was inserted in the mixture to a settling depth "L" of 5 in. (12.7 cm). After the sample had been withdrawn, the pipette was rinsed with distilled water and the rinsings added to the sample in a weighed evaporating dish. The temperature of the mixture was determined at the time that each sample was withdrawn.

Correction Factors

The samples were evaporated to dryness in an oven at 105 C, cooled in a desiccator, and weighed for the determination of solids. The weight of each dried sample was corrected for the amount of NaOH which was present in the sample. This correction could not be based on the calculated concentration of NaOH in the sample but had to be determined experimentally. It was found to be -0.0095 grams for each sample. The percentage of particles remaining in suspension at the time the sample was taken was determined from the simple formula:

$$P = \frac{W_1 - 0.0095}{W} \times 100$$

where

W₁ = weight of dried sample.

W = weight of sand originally dispersed in 25 ml. Since 50 grams were dispersed in 1000 ml and a 25-ml sample was withdrawn,

$$W = \frac{50 \times 25}{1000} = 1.25 \text{ grams.}$$

The maximum particle size present in each sample was calculated

from Stokes' law by substituting in the correct values for time, temperature, settling depth, specific gravity of the sand, etc. This computation was simplified considerably by the use of a nomographic chart such as that used by Jackson and Saeger. This nomograph was constructed for use with a sand having a specific gravity of 2.650. Since the specific gravities of the sands used were slightly higher than this value (Albany, 2.698; Lumberton, 2.676), a correction was made for this difference. This correction was calculated from the simple relationship derived from the Stokes formula:

$$\text{Specific gravity correction} = \sqrt{\frac{1.65}{\text{sp gr} - 1}}$$

For each of the sands used the correction factor amounted to 0.99. This factor multiplied by the diameter obtained from the nomograph gives the true value of "d." Obviously this correction is quite small and need not be made except when extreme accuracy is required.

After the last sample was withdrawn the mixture remaining in the cylinder was wet-screened on a No. 270 sieve under a light stream of tap water for 5 min. and then oven-dried on the same screen. The dried sample was removed from the screen, weighed, sieved, and the weights of the fractions collected on each sieve were determined in the usual way.

The complete distribution of particle sizes as determined both by the sieving test and by the pipette determination is represented most conveniently by a cumulative curve.

Table 2
RESULTS OF SIEVE ANALYSIS AFTER COMPLETING PIPETTE TEST ON LUMBERTON SAND (TABLE 1)

Sieve No.	Retained on Sieve, grams	%	Accumulative %
12	0.24	0.5	0.5
20	2.31	4.6	5.1
30	2.57	5.1	10.2
40	4.30	8.6	18.8
50	5.60	11.2	30.0
70	8.24	16.5	46.5
100	8.01	16.0	62.5
140	3.96	5.9	68.4
200	2.66	5.3	73.7
270	0.66	1.3	75.0
Pan	0.16	0.3	
		39.23	

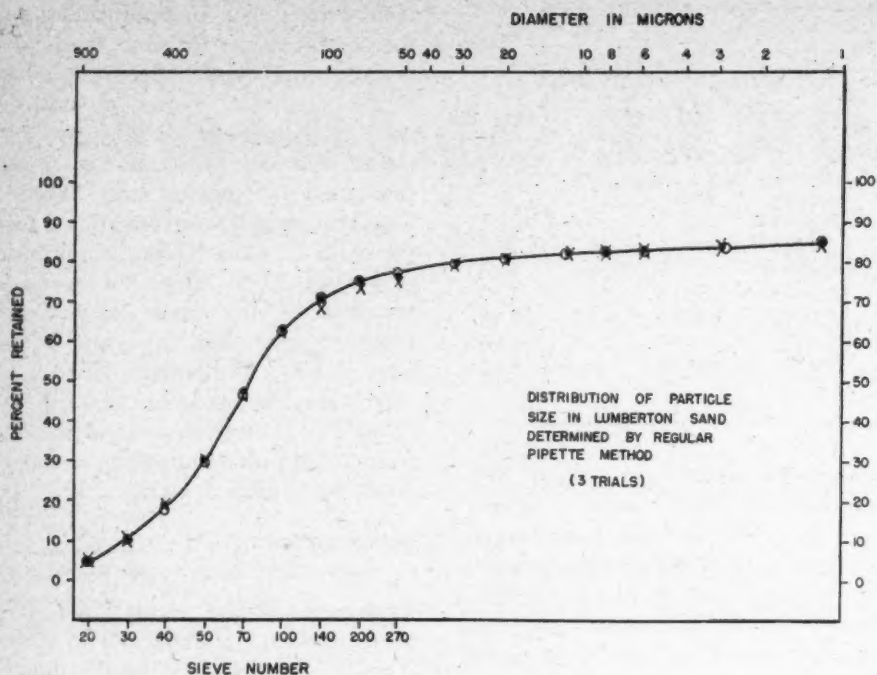


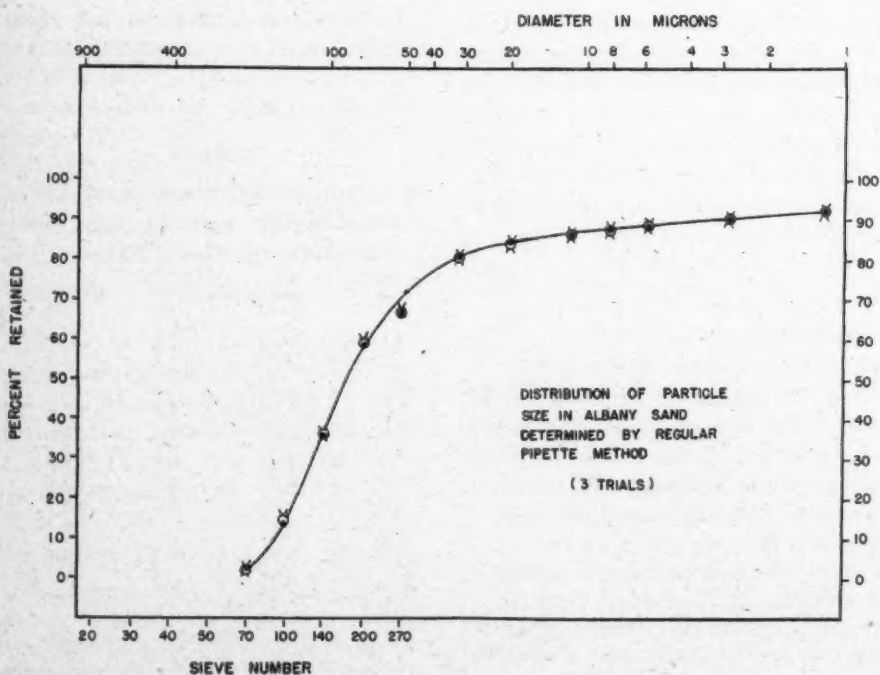
Fig. 1—Results of fineness tests on Lumberton molding sand by the regular pipette method.

The accumulated amount (expressed in percentages) that would be retained on each successively finer sieve is plotted on a semi-logarithmic graph paper against the diameter of the sieve opening. The percentage in each case refers to the particles coarser than the specified size. In the subsieve range the data obtained by the pipette method spec-

ify the percentage (P) of the test sample representing particles finer than a specified diameter. Therefore, in each instance the value, $100\% - P$, represents the fraction of particles coarser than the specified size.

Results Obtained. Three determinations were made on both the Albany and the Lumberton sands by the regular pipette method. The

Fig. 2—Results of fineness tests on Albany molding sand by the regular pipette method.



data were tabulated and cumulative curves plotted. A sample data sheet showing the results obtained in one of these tests is presented in Tables 1 and 2. The cumulative curves related to the regular pipette tests are shown in Figs. 1 and 2.

Andreasen Pipette Method. The Andreasen apparatus (Fig. 3) consists of a glass cylinder provided with a ground glass stopper through which passes the stem of a pipette. The cylinder has a capacity of approximately 643 ml when filled to the upper mark on the scale. The pipette extends 20 cm beneath the

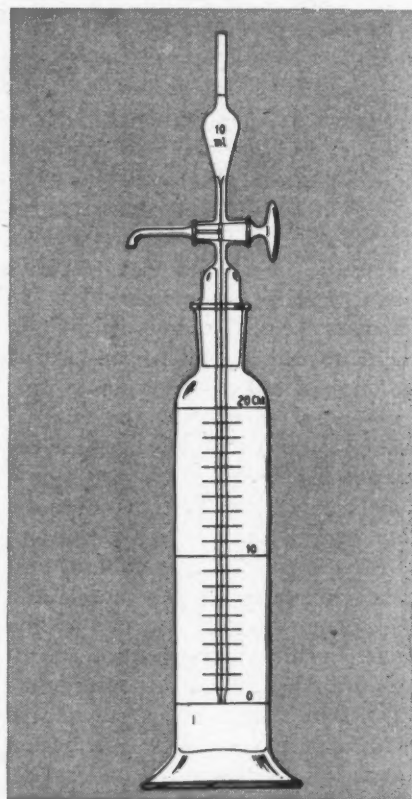


Fig. 3—Sketch of Andreasen pipette.

upper scale mark and ends at the level of the zero mark (4 cm from the bottom). The pipette has a capacity of approximately 10 ml, and is provided with a three-way stopcock and spout. The volume delivered by the Andreasen pipette bulb used in these tests was found to be 10.02 ml. The Andreasen pipette method is theoretically more accurate than the regular pipette method since the pipette remains in the cylinder throughout the test and the suspension is not disturbed.

Experimental Details. A 25-gram

AMERICAN FOUNDRYMAN

Table 3
RESULTS OF ANDREASEN PIPETTE TEST ON LUMBERTON SAND

Time, min	L, cm	d, microns	W ₁ , grams	W ₁ -0.0031, grams	P, %	100-P, %
2	20.00	43.1	0.0861	0.0830	21.2	78.8
5	19.65	27.0	0.0808	0.0777	20.0	80.0
15	19.30	15.5	0.0760	0.0759	19.5	80.5
30	18.95	10.8	0.0726	0.0693	17.9	82.1
60	18.60	7.6	0.0712	0.0681	17.5	82.5
250	18.25	3.7	0.0681	0.0650	16.7	83.3
1440	17.90	1.5	0.0644	0.0613	15.8	84.2

sample of oven-dried sand was placed in a mason jar with 300 ml of distilled water and 15 ml of 1% sodium hydroxide solution. After 5 min. of agitation the mixture was transferred carefully into the Andreasen cylinder and additional water was added up to the 20-cm mark.

The cylinder was placed in a constant-temperature bath and allowed to remain there until the mixture reached the required temperature (67 F). The cylinder was then removed from the water bath and, with the stopper in place, the mixture was shaken for 1 min. Immediately after this operation the cylinder was returned to the constant-temperature bath and a stop watch started. Samples were then withdrawn at specified time intervals and placed in an evaporating dish just as in the regular pipette method. The bulb of the pipette was rinsed with distilled water and these rinsings added to the sample in the evaporating dish. Each sample was then evaporated to dryness, cooled, and weighed. The weight of each dried sample was corrected for the

amount of sodium hydroxide present in the sample (determined experimentally to be -0.0031 grams).

The percentage of material still in suspension was obtained by considering the weight of solids in the sample as compared with the amount present in a similar volume immediately after the sand was dispersed. Since 25 grams of sand were dispersed in a volume of 643 ml, the amount of sand in 10.02 ml was

$$\frac{25}{643} \times 10.02 = 0.389 \text{ gram.}$$

The percentage of material in suspension was obtained from the formula

$$P = \frac{W_1 - 0.0031}{W} \times 100,$$

as was shown in the discussion of the regular pipette method.

The maximum diameter of the particles remaining in suspension at

the time of taking the sample was calculated from Stokes' formula, consideration being given to the fact that the level of the suspension changes after each withdrawal.

The mixture remaining in the pipette cylinder after withdrawing the last (1440 min.) sample was washed on a No. 270 sieve for 5 min., dried, and sieved in the usual manner. The cumulative curve was then plotted as described previously.

Results Obtained. A sample data sheet showing the results obtained in one of the Andreasen pipette tests is given in Tables 3 and 4 and the cumulative curves are presented on Figs. 4 and 5.

Hydrometer Method. The hydrometer method was introduced as a means of making fineness determination of soils by Bouyoucos⁶ in 1927. The procedure is relatively simple and consists of making hydrometer readings on a suspension of the sand in question at predetermined intervals of time. Both the settling depth and the percentage of material in suspension can be obtained from the hydrometer reading. It should be pointed out that in a suspension containing particles of various sizes, a density gradient will develop during settling. Consequently, a hydrometer which measures the specific gravity of the suspension will give a reading which represents the

Fig. 4—Results of fineness tests on Lumberton molding sand by the Andreasen pipette method.

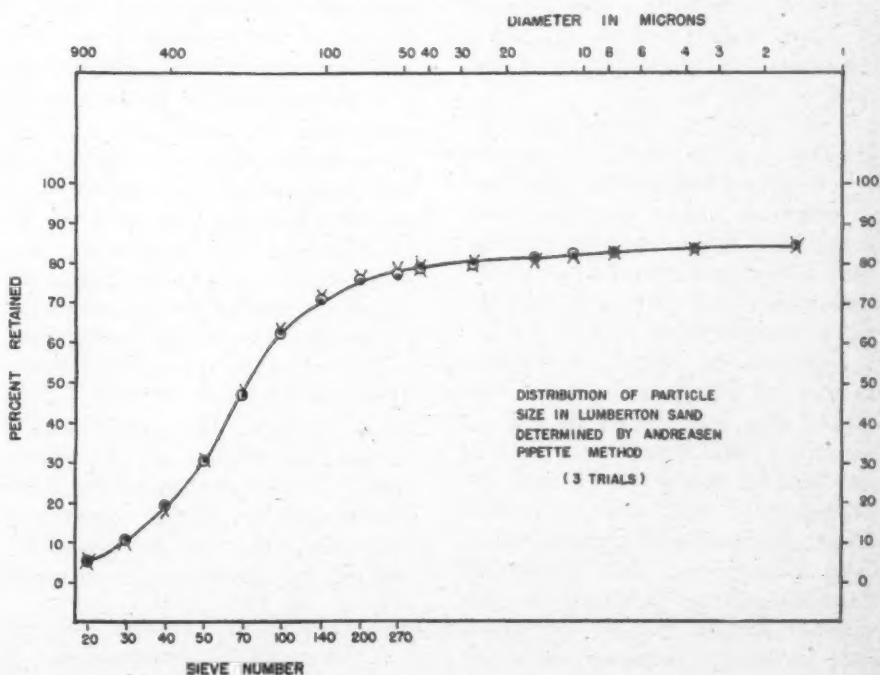


Table 4
RESULTS OF SIEVE ANALYSIS AFTER COMPLETING ANDREASEN PIPETTE TEST ON LUMBERTON SAND

Sieve No.	Retained on Sieve grams	%	Accumulative %
12	0.10	0.4	0.4
20	1.24	5.0	5.4
30	1.27	5.1	10.5
40	1.94	7.8	18.3
50	3.16	12.6	30.9
70	4.28	17.1	48.0
100	3.83	15.3	63.3
140	2.00	8.3	71.6
200	1.18	4.7	76.3
270	0.51	2.0	78.3
Pan	0.14	0.6	
	19.67		

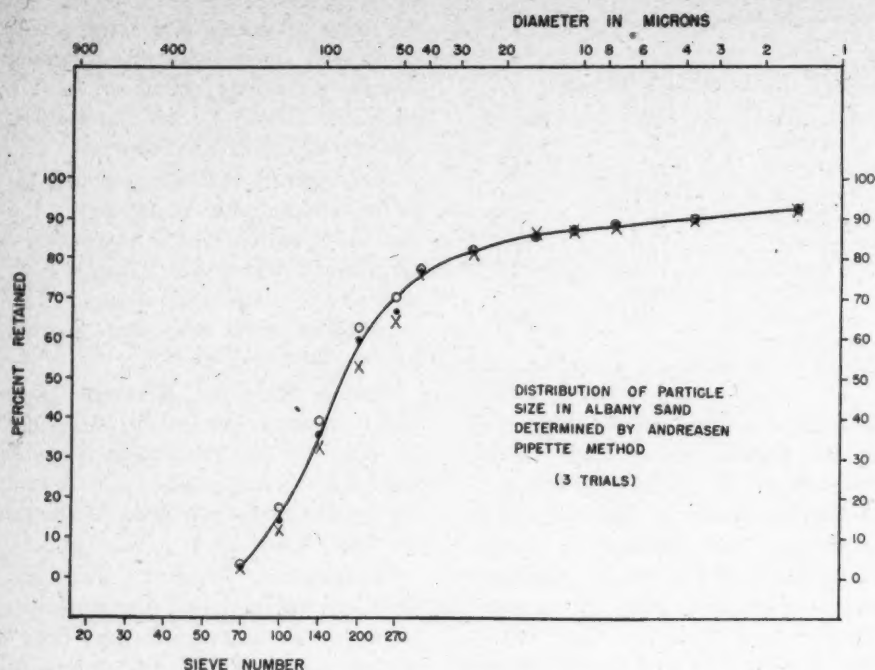


Fig. 5—Results of fineness tests on Albany molding sand by the Andreasen pipette method.

average specific gravity and, therefore, the average composition of the vertical zone occupied by the bulb. The settling depth depends on the distance from the surface of the suspension to the center of buoyancy of the hydrometer, and this distance changes during the course of a determination. The method of calibrating the hydrometer for evaluating the settling depths for different scale readings will be discussed later.

The standard equipment consists of a hydrometer and a glass cylinder of 18-in. height, 2.34-in. (5.85-cm) diameter, and graduated for a volume of 1000 ml.

Two types of hydrometers are available for this work; (1) a gram concentration hydrometer, graduated in grams of soil or sand per liter, and (2) a specific gravity hydrometer. In the present work all of the hydrometer tests were made with the gram concentration hydrometer.

Experimental Details. A 50-gram sample of oven-dried sand was placed in a 1-qt. mason jar with 25 ml of 3% sodium hydroxide solution and 475 ml distilled water and dispersed for 5 min. with an electric stirrer equipped with vertical baffles. The mixture was then transferred carefully into the liter cylinder. Additional distilled water was added until the level of the mixture reached

the liter mark on the cylinder. The cylinder was placed in a constant-temperature bath and allowed to remain there until the mixture reached the required temperature (67 F). The cylinder was then removed from the water bath and, with the top closed by the palm of the operator's hand, the mixture shaken thoroughly for 1 min. by turning the cylinder end over end. Immediately after this operation the cylinder was returned to the constant-temperature bath and a stop watch started. Successive hydrometer readings were taken at the top of the meniscus at the same time intervals as in the pipette tests.

After each reading the hydrometer was removed from the mixture, cleaned, and placed in a distilled water container in the constant-temperature bath until the time for the next reading. This removal was necessary to permit free settling of the suspension and to prevent adherence of the particles to the hydrometer.

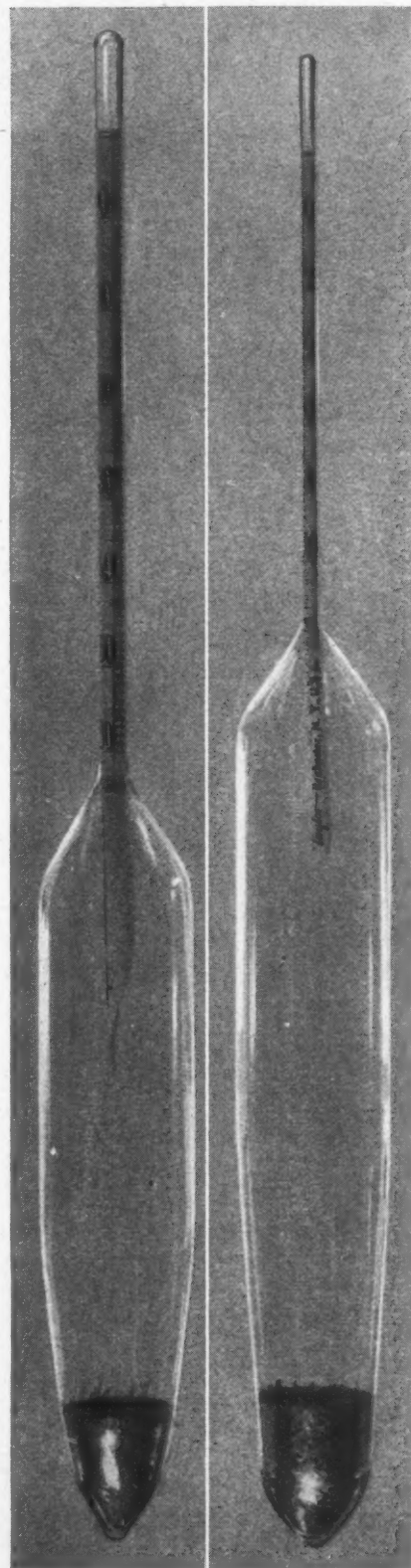
Determination of the Maximum Diameter of Sand Particles in the Sampling Zone. The computation of results involves two separate operations: (a) the determination of the maximum size of the particles in suspension, and (b) the determination of the percentage of dispersed

Fig. 6—Photographs showing gram concentration hydrometers.

particles remaining in suspension at a given time.

The settling depth in the hydrometer determination depends upon the dimensions of the hydrometer and upon the level at which it comes to rest in a given suspension.

The effective depth of immersion of the hydrometer at any sedimentation time was defined by Schuh-



mann⁷ as the depth of the center of volume of the hydrometer bulb, as it would be measured from the liquid surface with the hydrometer absent. Thus, the evaluation of this depth for any hydrometer reading requires data as to volume and dimensions of the hydrometer and the cross-sectional area of the container used. Computation of the effective depth of settling is given by Klein⁸ and Schuhmann⁷ as

$$H = H_1 + \frac{1}{2} \left(h - \frac{V}{A} \right)$$

where

H = effective depth of immersion,

H_1 = distance between the suspension level and the top of the hydrometer bulb,

h = length of the hydrometer bulb,

V = volume of the hydrometer bulb,

A = cross-sectional area of container.

The term $(-\frac{1}{2} V \text{ over } A)$ is a correction for the change in the distance from the surface of the suspension to the center of the sampling zone when the hydrometer is removed from the suspension. The distance from the surface of the suspension to the center of volume is a true settling depth only when the

hydrometer is in suspension. It may be seen that the hydrometer bulb is here assumed to be of a symmetrical shape and the center of its volume is taken at the midpoint of the bulb. Actually the hydrometer bulbs are seldom symmetrical (Fig. 6) and, therefore, the center of volume must be determined experimentally.

Center of Volume

The following method⁹ for locating the center of volume was used for this purpose in the present investigation. A graduated cylinder was filled with water and the volume of water recorded. The hydrometer was then immersed in steps (usually 2 cm) and the water level at each step recorded. The volume readings were plotted against corresponding depth of immersion readings and a "depth of immersion versus volume" curve drawn. The center of volume of a given hydrometer was determined as a point on this curve, corresponding to one-half of the total volume of water displaced by the hydrometer.

The method for locating the center of volume of one of the hydrometers is shown by a curve (Fig. 7).

If we let " L " represent the distance from the surface of the suspension to the center of volume as determined

in this manner, and " L " the effective depth of settling, the following relationship will hold:

$$L = 1 - \frac{V}{2A}$$

where " V " is the volume of the hydrometer bulb and " A " is the cross-sectional area of the container.

In the example (Fig. 7) discussed in the foregoing, $V = 89$ cc (for the particular hydrometer used) and $A = 27.03$ cm². Hence:

$$L = 1 - 1.65 \text{ cm}$$

This correction of -1.65 cm for the particular hydrometer used is incorporated into the scale at the right of Fig. 7 so that values for " L " may be obtained directly from the hydrometer readings. For example, for the hydrometer reading of 2.6 " L " is 12.0 cm; for a reading of 9 the " L " distance is 8.0 cm, etc.

Grain Diameter

Knowing the settling depth " L " the maximum grain diameter can be calculated according to Stokes' formula given in the foregoing.

In order to simplify the computation of the maximum diameter of the particles present at a distance " L " from the surface, the nomograph shown in Fig. 8 may be employed. This nomograph furnishes a convenient means for determining

Fig. 7—Determination of settling depth " L " of sand particles in the hydrometer test.

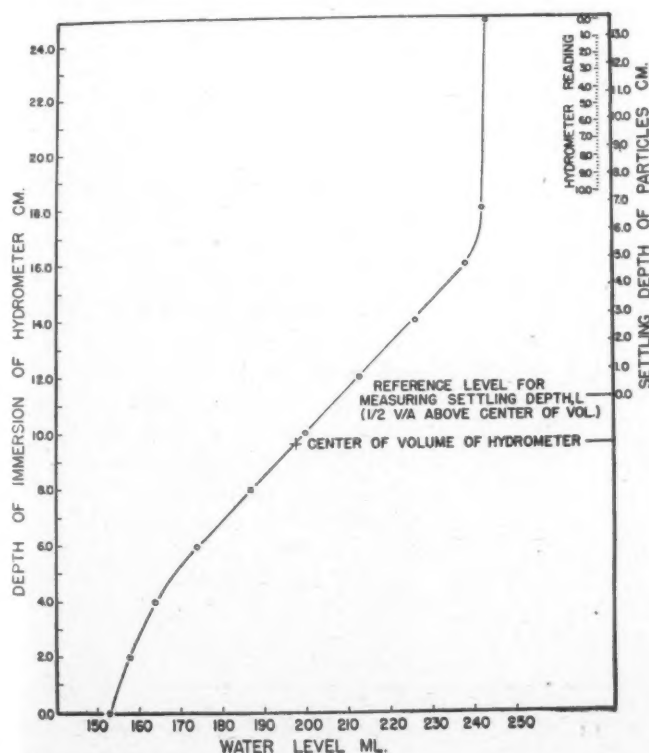


Fig. 8—Nomograph showing relationship between settling depth, time of settling and particle diameter of sand with reference to hydrometer test.

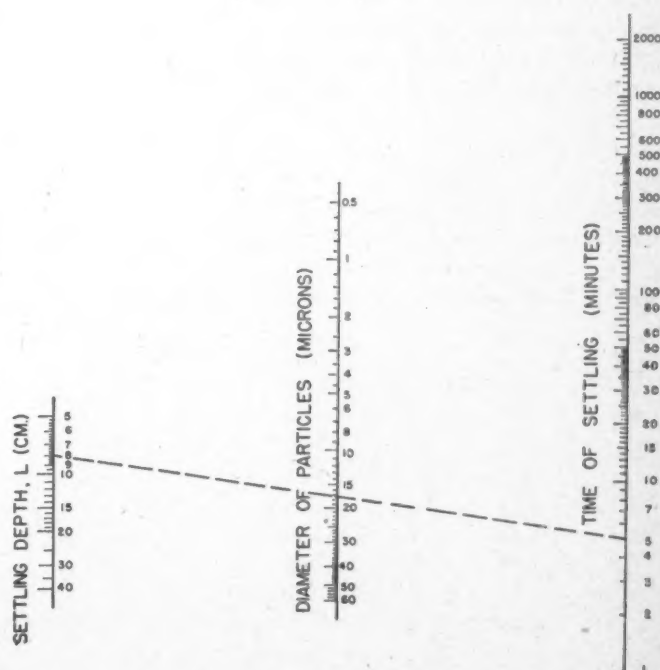


Table 5
VALUES¹⁰ OF CONSTANT "A"

Specific Gravity of Sand "G"	Constant "a"
2.95	0.94
2.85	0.96
2.75	0.98
2.65	1.00
2.55	1.02
2.45	1.05
2.35	1.08

Table 6
RESULTS OF HYDROMETER TEST ON LUMBERTON SAND

Time, min	Reading	Scale Correction	Electrolyte Correction	Reading Corrected	L, cm	Read from nomograph	Diameter "d" in microns—Corrected According to sp gr of sand	P, %	100—P, %
2	11.6	-0.9	-1.4	9.3	6.4	25.4	25.1	18.4	81.6
5	11.1	-1.0	-1.4	8.7	6.7	16.3	16.1	17.2	82.8
15	10.6	-1.0	-1.4	8.2	7.0	9.4	9.3	16.3	83.7
30	10.4	-1.0	-1.4	8.0	7.1	6.7	6.6	15.9	84.1
60	10.0	-1.0	-1.4	7.6	7.4	4.8	4.8	15.0	85.0
250	9.7	-1.0	-1.4	7.3	7.6	2.3	2.3	14.5	85.5
1440	9.4	-1.0	-1.4	7.0	7.8	1.0	1.0	13.9	86.1

the interrelation of time of settling, "T" (min.), distance, "L" (cm), and particle diameter "d" (microns). A straight line across the three branches of the nomograph indicates the foregoing interrelation; for example, the broken line in Fig. 8 shows that after 5 min. at a settling depth of 8 cm, the suspension at that depth will be free from all particles larger than 17 microns in maximum diameter.

It should be noted that in constructing this nomograph it was assumed that the test was carried out at the constant temperature of 67 F, and that the specific gravity of the sand was 2.65. Since the specific gravities of the sands used were somewhat different from this value, the maximum diameters "d" should be corrected, as explained previously (with reference to the regular pipette test).

Determination of the Percentage of Dispersed Sand Particles Remaining in Suspension. For the gram concentration hydrometer the percentages of dispersed sand in suspensions

corresponding to different hydrometer readings are calculated¹⁰ according to the following formula:

$$P = \frac{(R \pm \Delta R) a}{W} \times 100$$

where

P = percentage of originally dispersed sand remaining in suspension at a distance "L" below the surface,

R = corrected hydrometer reading. (Before substituting "R" into this formula, it was necessary to correct for the sodium hydroxide that was used as deflocculating agent for the suspension. This correction was calculated and also checked experi-

mentally and found to be -1.4 when 25 ml of 3% sodium hydroxide was present in 1 liter.)

ΔR = temperature correction for hydrometer reading. (For a temperature of 67 F this correction is zero.)

W = weight in grams of oven-dried sand originally dispersed (usually 50 grams),

a = constant depending on the specific gravity of the sand particles.

The values "a" when referred to different values of the specific gravity of soil or sand particles "G" are given in Table 5¹⁰. It is sufficiently accurate for ordinary sand tests to select a value for "a" for the specific gravity nearest to that of the par-

Fig. 9—Results of fineness tests on Lumberton molding sand by the hydrometer method.

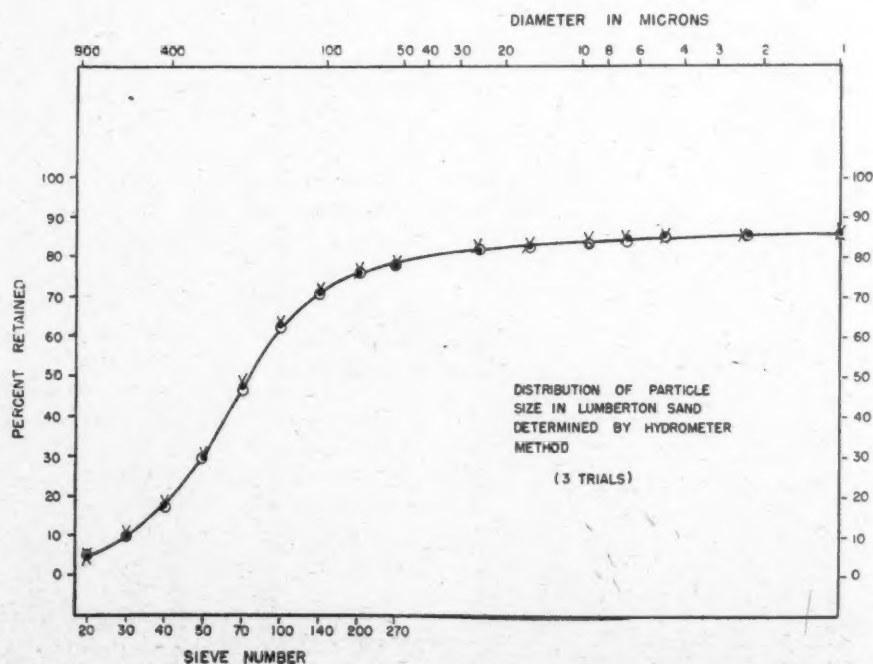


Table 7
RESULTS OF SIEVE ANALYSIS AFTER COMPLETING HYDROMETER TEST ON LUMBERTON SAND

Sieve No.	Retained on Sieve, grams	%	Accumulative %
12	0.23	0.5	0.5
20	2.14	4.3	4.8
30	2.57	5.1	9.9
40	3.78	7.6	17.5
50	6.06	12.1	29.6
70	8.77	17.5	47.1
100	7.79	15.6	62.7
140	4.17	8.3	71.0
200	2.41	4.8	75.8
270	.99	2.0	77.8
Pan	.47	0.9	
	39.46		

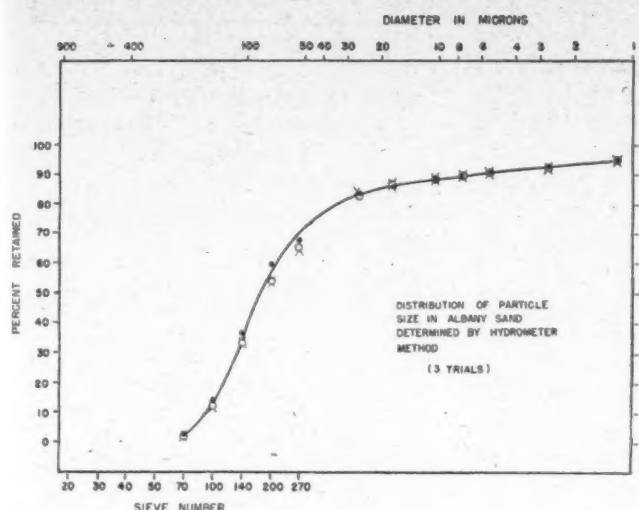


Fig. 10—Results of fineness tests on Albany molding sand by the hydrometer method.

ticular sand tested. For both the Albany and Lumberton sands this value was 0.99. Therefore,

$$P = \frac{0.99R}{50} \times 100 = 1.98R$$

where

P = percentage of originally dispersed sand remaining in suspension at a distance "L" below the surface,

R = corrected hydrometer reading.

Results Obtained. Three tests were run on each of the two molding sands. Cumulative curves for these tests are shown in Figs. 9 and 10. A sample data sheet giving in detail the results obtained in one of the hydrometer tests is presented in Tables 6 and 7.

The scale of the hydrometer used in these tests was calibrated and a suitable correction was made (see Appendix).

Summary and Conclusion

Examination of the results obtained on each sand in three determinations by the same method (Figs. 1, 2, 4, 5, 9 and 10) indicates a rather high degree of precision. For ordinary purposes, therefore, a single determination by a reasonably careful operator would be sufficient to establish the distribution of particle size for a given sand in the subsieve range.

In order to compare the fineness test results obtained by the three different methods used in this study, charts were prepared showing the average results by each method for both Albany and Lumberton sands.

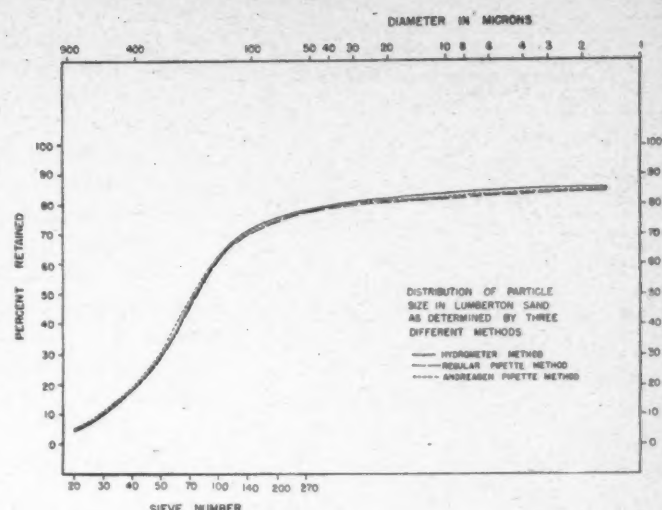


Fig. 11—Cumulative curves showing results of fineness tests on Lumberton molding sand by three methods.

These graphs (Figs. 11 and 12) indicate that there was a good agreement between the average cumulative curves representing the different methods of analysis.

The authors believe, therefore, that any of the methods employed is satisfactory for this purpose. In selecting a method to be used, one should consider the laboratory skill and technique required for each procedure, the time involved for testing, and equipment available.

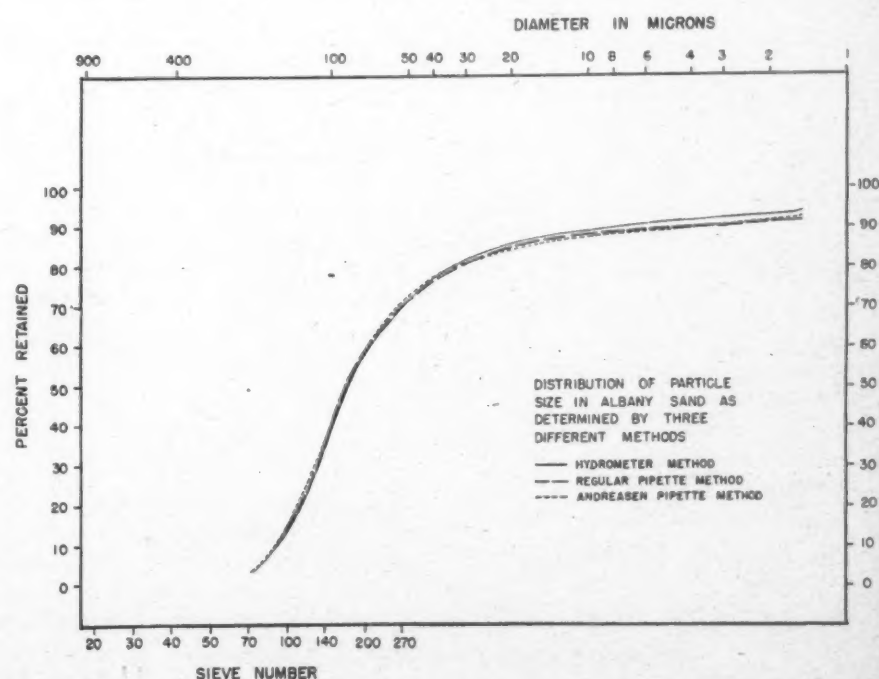
The hydrometer method seems to be the most convenient since it in-

volves simply taking a hydrometer reading and then referring to simple charts for obtaining the values for the limiting particle size according to Stokes' law, while the percentage of material still in suspension is obtained from a simple calculation.

The pipette tests are more time consuming chiefly because of the time required in evaporating, drying, cooling, and weighing. However, in the regular pipette test no special equipment is required other than that in the chemical laboratory.

The Andreasen pipette method,

Fig. 12—Cumulative curves showing results of fineness tests on Albany molding sand by three methods.



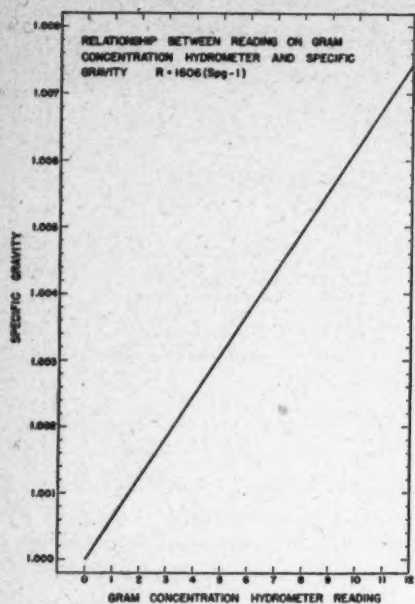


Fig. 13—Graph for converting specific gravity values to equivalent readings on the gram concentration scale.

which involves special apparatus, is theoretically more accurate than the regular pipette method since the stem remains in the cylinder throughout the test and the suspension is not disturbed. The fact that the stem of the pipette is stationary, however, might appear to introduce an error, since some liquid remains in the stem after each sampling and is always drawn up into the bulb as a part of the next sample. The possible error due to this source would, of course, be quite small. This was demonstrated in a special experiment in which the determination

was carried out in the usual manner except that two samples instead of one were withdrawn after each settling period. The results were in good agreement indicating that no appreciable error was introduced from this source.

Experience in the authors' laboratory with the different methods of determining distribution of particle size in the clay fractions of foundry sands indicates that the hydrometer method is preferable because it yields satisfactory results conveniently in a minimum of time.

Appendix

Calibration of Hydrometer Scale. The scale of each hydrometer should be calibrated for precise work. Essentially this involves the testing of the hydrometer in solutions of known specific gravities in the range in which the instrument is to be used. The relationship between the "R" readings of the gram concentration hydrometer and the corresponding values for specific gravity may be obtained from the formulas¹⁰ that are used for calculating the percentage of material in suspension from readings on the gram concentration hydrometer

$$P = \frac{Ra}{W} \times 100$$

and on the specific gravity hydrometer

$$P = \frac{1606 (Sp g-1) a}{W} \times 100$$

Thus $R = 1606 (sp gr - 1)$. This

Table 8
DENSITY VALUES OF SODIUM CHLORIDE SOLUTIONS AT DIFFERENT TEMPERATURES¹¹

NaCl Concentration by Weight, %	Density Values, grams/ml		
	10 C (50 F)	20 C (68 F)	25 C (77 F)
1	1.00707	1.00534	1.00409
2	1.01442	1.01246	1.01112
4	1.02920	1.02680	1.02530

Table 9
DENSITY AND SPECIFIC GRAVITY VALUES OF SODIUM CHLORIDE SOLUTIONS AT TEMPERATURE OF 67 F (19.4 C)

NaCl Concentration, %	Densities, grams/ml	Specific Gravities (sp gr = density / 0.99835)
0	0.99835	1.00000
1	1.00546	1.00712
2	1.01259	1.01426
4	1.02696	1.02866

relationship between "R" and specific gravity is shown for a range of values by the graph in Fig. 13.

The zero point of the gram concentration hydrometer may be checked by making a reading in boiled distilled water at 67 F, whereas sodium chloride solutions of known concentrations are suitable for checking other points on the scale.

Density values for aqueous solutions of sodium chloride (1, 2, and 4% NaCl) at temperatures of 10, 20, and 25 C obtained from the International Critical Tables are shown in Table 8. From these values, the densities at 67 F (19.4 C) were obtained by interpolation and the corresponding specific gravities calculated (Table 9). The relationship between concentration of sodium chloride and specific gravity at 67 F is shown in Fig. 14.

Three or more sodium chloride solutions of the desired concentrations are carefully prepared, using dried C.P. sodium chloride and boiled distilled water. The exact "R" values (gram concentration readings) at 67 F for each solution are obtained by referring to Figs. 14 and 13, respectively. These solutions are brought to a temperature of 67 F and hydrometer readings made, exercising the same precautions recommended for the regular use of the hydrometer. The actual hydrometer readings are plotted against the true

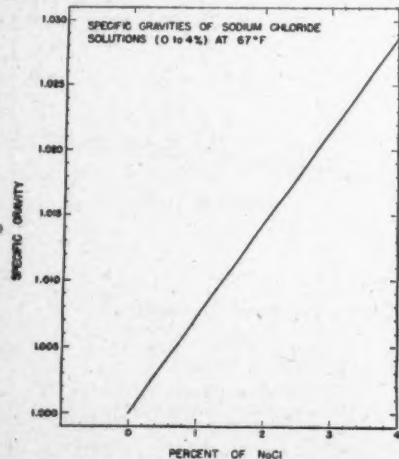


Fig. 14—(left) Specific gravities of aqueous sodium chloride solution at 67 F.

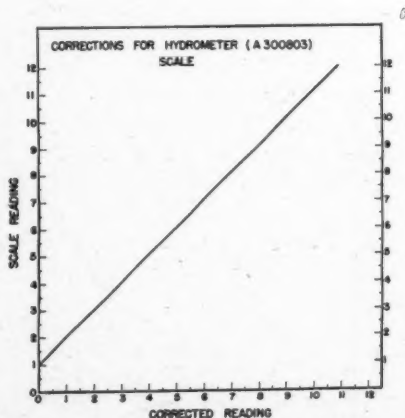


Fig. 15—(right) Graph for obtaining corrected readings from scale readings on gram concentration hydrometer.

or correct readings, as shown in Fig. 15, and the scale correction for any scale reading of the hydrometer may be obtained from this graph.

Acknowledgment

Grateful acknowledgment is made to Dr. Vernon C. F. Holm for suggestions and assistance, and to Mrs. Lura F. Roehl for preparing the charts and graphs.

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Further discussions were held by representatives of the various groups in July and again in August.

As organized on November 8, each of the eight foundry organizations will be represented on the Council by two members, one of whom must be an elected president. No provision has been made for the raising of funds; instead, it is intended primarily that, at the outset, the Council shall meet three or four times a year for discussion of mutual problems. Out of such meetings undoubtedly will come a better understanding of respective fields and a greater degree of cooperation on the part of all.

Council's Activity

In all probability, the Council will act somewhat as a fact-finding body for better coordination of group activities within the industry. Each of the member organizations will carry on in its accepted field as in the past, with, however, the benefit of Council discussions to assist all in better serving the industry. It is contemplated that, for the first time, the foundry industry may find in the Council a qualified and representative spokesman when overall representation seems advisable.

For the present, National President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis, and National Vice-President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., will represent A.F.A. on the National Castings Council.

CASTINGS COUNCIL Created by Eight Foundry Societies

FINAL STEPS toward formation of a National Castings Council, the first overall cooperative effort entered into by the leading technical, management and trade associations of the castings industry, were taken at a meeting of association representatives held November 8 at the Waldorf-Astoria Hotel, New York. Organized as an informal and representative group for discussion of problems of interest to the entire industry, the new Council, in which A.F.A. will be a participating member, has already been heralded as a body capable of great influence on foundry progress as a whole.

Participants

In addition to A.F.A., participants in the Council at present include: Gray Iron Founders Society, Steel Founders Society of America, and Malleable Founders Society, all of Cleveland; Non-Ferrous Founders Society and National Founders Association, both of Chicago, and Foundry Equipment Manufacturers Association and Foundry Supply Manufacturers Association, Cleveland.

The idea of an overall group including all branches and phases of

the foundry industry has been advanced for many years, over a period that includes two world wars. Many far-sighted foundry executives have long advocated establishment of a common meeting ground for joint consideration of their interlocking activities.

When World War II broke out, the president of A.F.A., H. S. Simpson, National Engineering Co., Chicago, endeavored to organize a co-operative, industry-wide group to handle war production problems of the foundry industry in Washington, D. C. This effort failed to materialize, with the result that foundry production as a whole was never fully coordinated during the war years, to the detriment not only of the foundries themselves, but also of the production of castings for war purposes.

First Meeting

The plan for a National Castings Council first was broached at an informal luncheon meeting held during the 50th Anniversary Foundry Congress of A.F.A., held at Cleveland in May, 1946, the meeting being called at the instigation of National Founders Association leaders.

Can You Help?

A.F.A. is anxious to obtain some copies of A.F.A. *TRANSACTIONS*, Volume 52 (1944) from members who may have no use for copies in their files. The supply of this volume is entirely exhausted and a number of important requests have been received for this edition.

For intact copies in good condition A.F.A. will be glad to make arrangements for purchase. If you have a copy of Volume 52 which you do not need, please forward promptly to: The Secretary, American Foundrymen's Ass'n, 222 West Adams Street, Chicago 6, Ill.

34th A.F.A. CHAPTER At Seattle Approved by Directors

THE WASHINGTON CHAPTER, with headquarters in Seattle, soon will become the 34th chapter of A.F.A., following unanimous approval by the National Board of Directors of a chapter petition bearing 72 signatures of Pacific Northwest foundrymen representing some 36 operating companies. Elected officers of the local group, headed by Chairman C. M. Anderson, Eagle Brass Works, Seattle, have been notified of the Board action, and it is expected that the famed "cast iron rattle" will be presented at official installation ceremonies before the first of the year.

Officers and directors of the group, the first chapter organized on the Pacific Coast since the Oregon chapter was installed in March 1945, were elected unanimously at an open meeting in Seattle, October 3, and will serve until regular nominations and elections can be held. In addition to Chairman Anderson, other officers and directors include:

Vice-Chairman, Geo. M. Rauen, Olympic Foundry Co., Seattle.

Secretary-Treasurer, A. D. Cummings, Western Foundry Sand Co., Seattle.

Directors: E. D. Boyle, Puget Sound Naval Shipyard, Bremerton; V. C. Creton, Atlas Foundry & Machine Co., Tacoma; Howard Heath, Sumner Iron Works, Everett; G. S. Schaller, University of Washington, Seattle; C. W. Summerville, Seattle Brass Co., Seattle; J. D. Tracy, Salmon Bay Foundry Co., Seattle.

Interest in a Seattle region chapter first was evidenced several years ago, and culminated in the October 3 meeting, at which time National President S. V. Wood and National Secretary-Treasurer W. W. Maloney addressed the meeting in the course of their visit to West Coast chapters. President Wood stressed the role of the individual in A.F.A. activities and urged the management of Pacific Northwest foundries to play an active part in the new group. He called attention to the foundry opportunities presented by rapid development of the Northwest country and praised the progressive spirit back of the new movement.

Secretary Maloney brought out

some details of membership, committee work and publications, and outlined the organization and operation of the Association. Chairman Anderson also introduced the Chairman of the Oregon chapter, W. R. Pindell, Northwest Foundry & Furnace Works, Portland, who congratulated the group on approving a chapter petition. On behalf of Oregon foundrymen, he welcomed the new Washington group and of-

ferred the co-operation of his chapter.

The enthusiasm of foundrymen in the Seattle territory for a chapter was shown by the fact that many attended from points fully 100 miles distant.

Vice-Chairman Rauen is serving as Chairman of the Program Committee and is anxious to be contacted by eastern foundrymen who may be contemplating visits to the West Coast, so that arrangements can be made for them to address future meetings of the Washington chapter.

TULSA FOUNDRYMEN Discuss Formation of A.F.A. Chapter

MEETING at the plant of the Enardo Foundry & Mfg. Co., Tulsa, Okla., on November 11, some 15 foundrymen of the Tulsa area agreed to form a steering committee for the purpose of developing interest in the formation of a new Chapter of the American Foundrymen's Association.

Under the chairmanship of M. C. Helander, production superintendent of the Enardo company, the committee voted to call an open meeting at Tulsa on December 6 in order to determine the extent of possible support and to obtain the required fifty signatures for submitting a chapter petition to the National Board of Directors.

Chapter Possibility

Following upon several previous efforts to organize a local A.F.A. group, it was the consensus of opinion among the members of the steering committee that the chapter goal might now be reached. Accordingly, arrangements subsequently were made for A.F.A. Technical Director S. C. Massari to attend the December 6 meeting and to outline the advantages of membership and the mechanics and obligations of chapter operation.

In addition to Mr. Helander, the following Oklahoma foundrymen attended the November 11 preliminary meeting: C. B. Fisher, Enardo Foundry & Mfg. Co., Tulsa; Wm. R. Peak, W. R. Peak Service Shops, Oklahoma City; Paul Coman, Coman Pattern Works and Big Four

Foundry, Tulsa; Anton Johnson, Clifford Boyd, Hilbert Hibbs, Frank Madrigal and Frank Scaggs, all of Oklahoma Steel Castings Co., Tulsa; B. P. Glover, M. A. Bell Co., Tulsa; K. L. Kimball, Thompson-Hayward Chemical Co.; R. W. Trimble, Bethlehem Supply Co., Tulsa; Ernest Wall, Big Four Foundry, Tulsa, and Fred Fogg and C. M. Diel, Acme Foundry & Machine Co., Blackwell, Okla.

Association Publishes Transactions for 1945

TRANSACTIONS of the American Foundrymen's Association, Vol. 53, is available to members at \$4.00 per copy, or to non-members at \$15.00 per copy. It is attractively bound in fine grade, deep-red binding cloth and printed on paper of quality comparable to that used in the AMERICAN FOUNDRYMAN, and is 8½ x 11½ in. in size, differing from previous editions which were 6 x 9.

Volume 53 contains 459 pages—421 pages devoted to vitally important technical material, and 38 pages, in the forepart of the volume, to A.F.A. Board Meeting Minutes, Reports of A.F.A. Officers, Financial Statement, etc. This worthwhile publication will be a valuable addition to every technical library.

Company and Sustaining Members on record during the 1945 fiscal year will receive one copy gratis upon request, and these copies are now being mailed.

AMERICAN FOUNDRYMAN

CAST STEEL

HOMOGENIZATION HEAT TREATMENTS

John G. Kura
and
Philip C. Rosenthal
Battelle Memorial Institute
Columbus, Ohio

METALLOGRAPHY. The photographs in Fig. 22 show the as-received macrostructure of a full cross section, extending from edge to edge and passing through the center, of each of the five 36x36x2-in. plates investigated. Two such sections taken at right angles are shown for Plates 2, 3, and 5.

Photomicrographs of Plates 2, 3, and 5 show where the risers were located before their removal. The structure under the risers is mottled while that in other parts of the plate is dendritic. Plates 2 and 3 exhibit a "centerline weakness" in the areas not under the risers.

Photomicrographs in Fig. 23 show the type of inclusions and typical as-cast microstructures found in each of the five test plates. The nonmetallic inclusion rating for each plate, according to Sims and Dahle³, is as follows:

Plate No.	Inclusion Type
1	III
2	III
3	I and II
4	III
5	I

The microstructures of the five plates are typical cast structures. A close examination of the micro-

graphs representing the structures of Plates 3 and 4 will show a decided black line at the primary austenite grain boundaries. In some cases this type of grain boundary has been associated with steels containing boron. However, chemical analyses show that the boron content of these steels is negligible; therefore, these unusual grain boundaries must be the result of something other than boron.

Figures 24 and 25 show the macrostructure of each of the coupons from Plates 1 and 2 after they had received their particular homogeniz-

This is the second and concluding installment of the paper and deals with the metallographical aspects of the investigation. Part I appeared in the November issue.

ing treatment. In both plates the dendritic structure becomes less sharp with successive increases in temperature and holding time. This effect was typical of that noted in all the plates.

Figures 26 and 27 indicate that homogenizing treatments have a tendency to make the microstructure more uniform in the as-homogenized condition. This effect was noticed in Plates 1, 2, 4, and 5; relatively little change occurred in the structure of Plate 3.

In general, the change in structure consists of changing the ferrite from equiaxed, polyhedral grains to acicular ferrite, and of making its distribution more uniform. In the case of Plate 4 the general structure

is not changed appreciably; however, the areas of high alloy segregation, such as the one shown in Fig. 28, are somewhat equalized.

In this respect the improvement obtained from homogenizing at 2250° F. is illustrated by Fig. 29. These areas of high alloy segregation usually contained quenching cracks when the steel received a quenching treatment after little or no homogenization. However, prolonged homogenizing treatments seemed to break down the carbides and equalize the composition so that no cracks occurred on quenching.

Figure 30 shows the microstructure of the unhomogenized coupons of the five plates in the quenched and tempered condition, in contrast with the microstructure of coupons receiving the 12-hr. treatment at 2050° F. prior to quenching and tempering. A comparison of these photomicrographs shows that, in general, there is no improvement in microstructure.

It can be concluded that in some cases where high alloy contents are encountered, homogenizing as ordinarily practiced may improve the microstructure, but in relatively low alloy steels no benefits (to microstructure) are gained.

High Alloy Concentration

Examination of the specimens homogenized at 2250° F. for 12 hr. substantiated the conclusions reached from the other specimens; namely, that homogenizing treatments have no effect on the microstructures of quenched and tempered specimens, except in higher alloy steels containing areas of high alloy concentration. When such areas are encoun-

Presented at a Steel Session of the Fiftieth Annual Meeting, American Foundrymen's Association, at Cleveland, May 8, 1946, this paper is based on work done for the Office of Scientific Research and Development, Contract No. OEMsr-450 with Battelle Memorial Institute.

Plate 1
Vertical

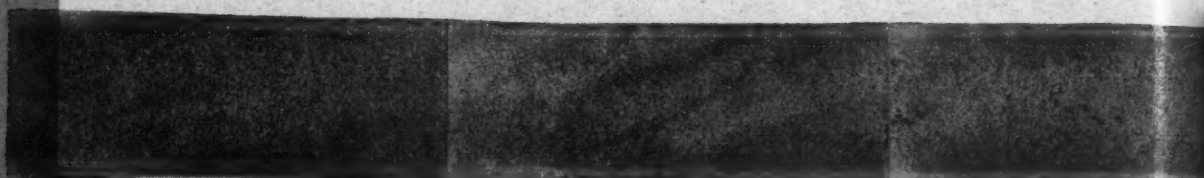


Plate 2
Vertical



Plate 2
Horizontal

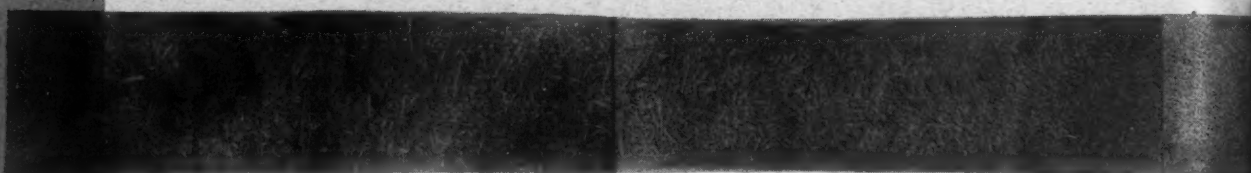


Plate 3
Vertical



Plate 3
Horizontal



Plate 4
Vertical



Plate 5
Vertical

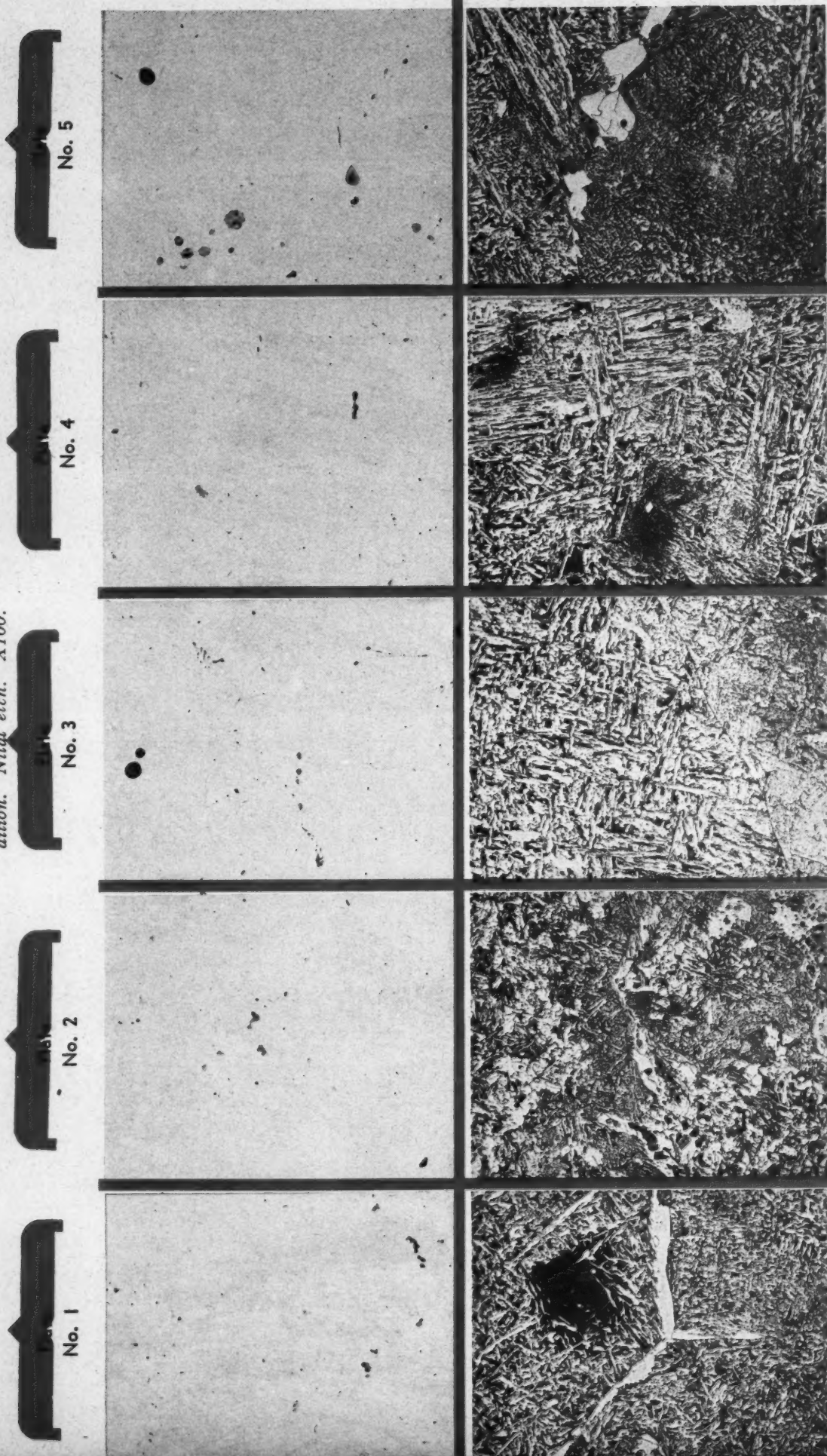


Plate 5
Horizontal



Fig. 22—Full section macro survey of each plate. See Fig. 1 for location of the sections in each coupon.

Fig. 23—Top row—Typical inclusions of each of the five cast plates. Unetched. X100.
Bottom row—Typical microstructures of each of the five plates in the "as received" condition. Nitral etch. X100.



tered in the as-cast steel, they are effectively diffused by a prolonged high-temperature treatment such as the 12 hr. at 2250° F. used in the present case.

Quench Cracking. It was noted earlier in this paper that Steel 4 tended to crack during quenching unless special precautions were taken. The problem of quench cracking was made the subject of considerable study in another phase of the research work sponsored by the Office of Scientific Research and Development.

As a result of this work, valuable information regarding the relative importance of a number of variables influencing quench cracking was obtained. Although the subject is too voluminous to be discussed here, those results pertinent to the present investigation are worth noting.

As might be expected, carbon was found to be a potent element controlling quench cracking, the incidence of cracking increasing markedly with the carbon content. This would account for the difficulty experienced with Plate 4, which was higher in carbon than the rest of the steels. This work also showed that a homogenizing treatment at 2300° F. for 8 hr. was effective in reducing quench cracking.

Quenching Temperature

Furthermore, less cracking was experienced the lower the quenching temperature used during a hardening treatment. Although pretreatment in the form of a high-temperature homogenization was found to be beneficial, almost equivalent results were obtained by extending the holding time at the austenitizing temperature during the quenching treatment; consequently, the true worth of homogenization from the standpoint of reducing quench cracking is difficult to evaluate.

General Discussion. The general impression gained from a review of all the data is that the various homogenizing treatments were on a par in their effect on the properties of the five steels under consideration. Furthermore, there was no direct evidence that homogenizing benefited the mechanical properties or hardenability.

Most of the data which suggested that homogenizing was helpful were contained in the study of microstructure and quench cracking. It

was shown by the microstructural study that in four out of the five steels, heterogeneity in the as-homogenized structure was broken up by using the higher temperature or longer holding times.

It was also apparent that in the case of Plate 4, which was of high hardenability, the more drastic homogenizing treatments broke up areas of alloy segregation and reduced the number of quench cracks. Despite this equalizing effect of the homogenizing heat treatment on the microstructure of the air-cooled specimens, this effect was not apparent in the quenched and tempered structures, and it was not possible to distinguish between unhomogenized or drastically homogenized quenched and tempered steel.

Segregation Type

Strictly speaking, heat treatments in the temperature range from the critical to about 2000° F. may not actually "homogenize" the structure. The segregation that occurs in cast steels is of the dendritic type, and the little evidence in the literature concerning this type of segregation leads to the conclusion that excessively high temperatures—in the neighborhood of 2300° F.—are necessary before an appreciable degree of homogeneity is attained.

Parke and Herzig², for instance, held a rolled steel at 2310° F. for 80 hr. to eliminate the bands originating from the original dendritic structure. Davenport⁴ held various steels at 2200° F. to 2250° F. for 40 hr. to achieve homogeneity. A die block showing signs of segregation was given a fivefold increase in ductility by homogenizing for 10 hr. at 2200° F., or for 7 hr. at 2300° F.⁵ Segregation was still evident after these heat treatments. A treatment of 16 hr. at 2000° F. was completely ineffective in improving properties.

From the limited amount of information available, it appears that a homogenizing temperature of about 2200° F. is the minimum which can be expected to be effective in dissipating dendritic segregation, and that, even then, many hours at temperature are necessary.

Conclusions

In the five steels used for this investigation, it was found that:

1. Homogenizing treatments ex-

erted no obvious influence on the austenitic (fracture) grain size. In general, a finer grain size was established in the coupons receiving no homogenization than in those which were homogenized.

2. Within the limits of error of the test, the hardenability of each steel remained the same regardless of the homogenizing time or temperature. The hardenability of the unhomogenized specimens generally tended toward the highest hardenability displayed by any of the specimens. These results were obtained on steels that varied in hardenability from air-hardening to fairly shallow-hardening properties.

3. The two steels with the lowest hardenability rating did not harden fully across the 2-in. section.

4. Considering the effects of both time and temperature during the homogenizing treatment, no difference in low-temperature notched-bar properties could be discerned. Unhomogenized steel was not inferior to homogenized steels in notch toughness.

5. Temper brittleness exists to a characteristic degree in each of the steels and is not affected by homogenization.

6. The data suggests that the function of molybdenum may be to move the range of temper brittleness to lower temperatures rather than to repress the brittleness entirely.

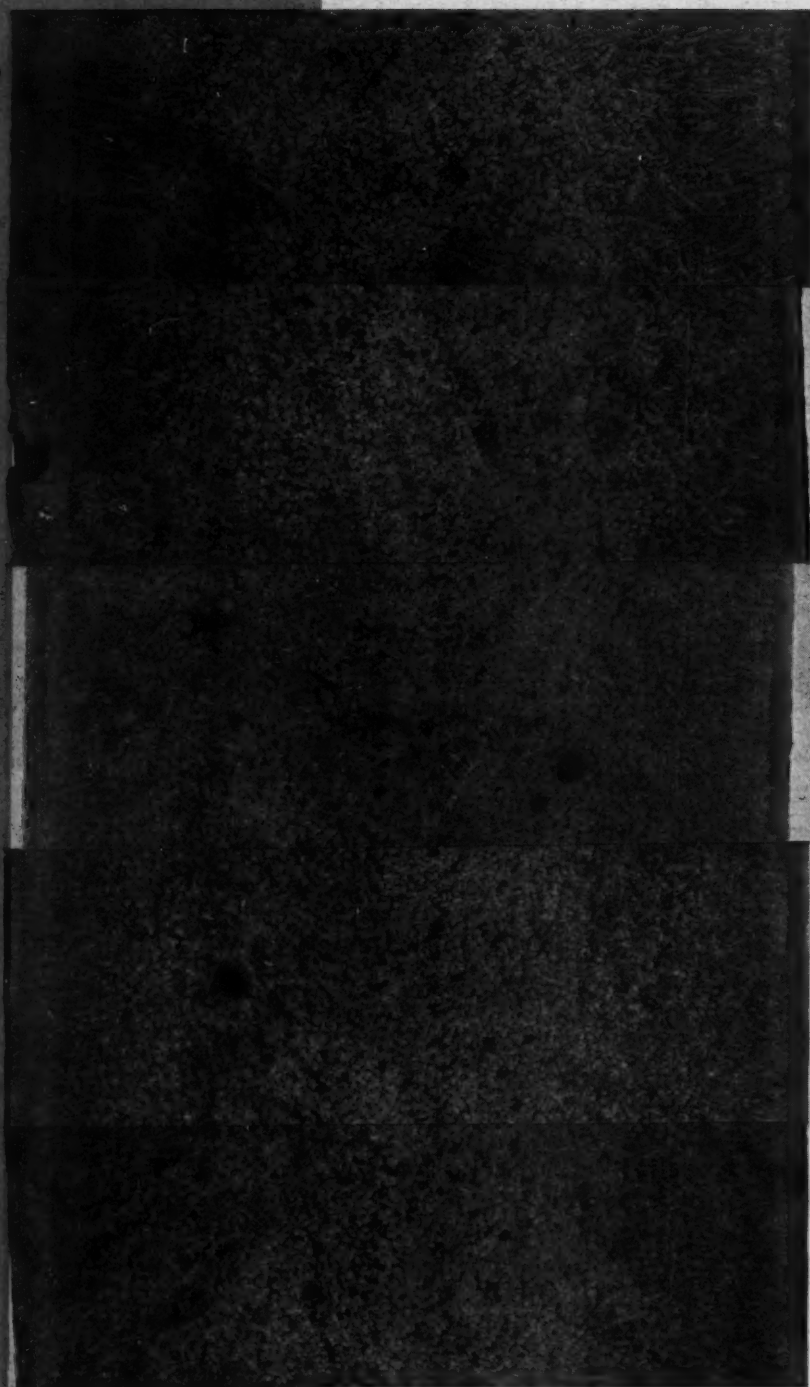
7. The notched-bar values for all of the steels were about the same at room temperature.

8. Homogenizing had no effect on tensile properties. The ductility of two of the steels was inferior, but this appeared to be caused by unsoundness in the casting rather than by any other factor.

9. No effect of homogenizing was observed in the microstructure of quenched and tempered specimens; however, the more drastic homogenizing treatments reduced the heterogeneity in the as-homogenized microstructures of four out of five steels.

Dendritic Pattern

These treatments also reduced the sharpness of the dendritic pattern on macro-specimens. All but the last traces of the dendritic structure were removed by the 2250° F. treatment, and segregated areas in the higher alloy steels were successfully diffused. However, no change was ap-

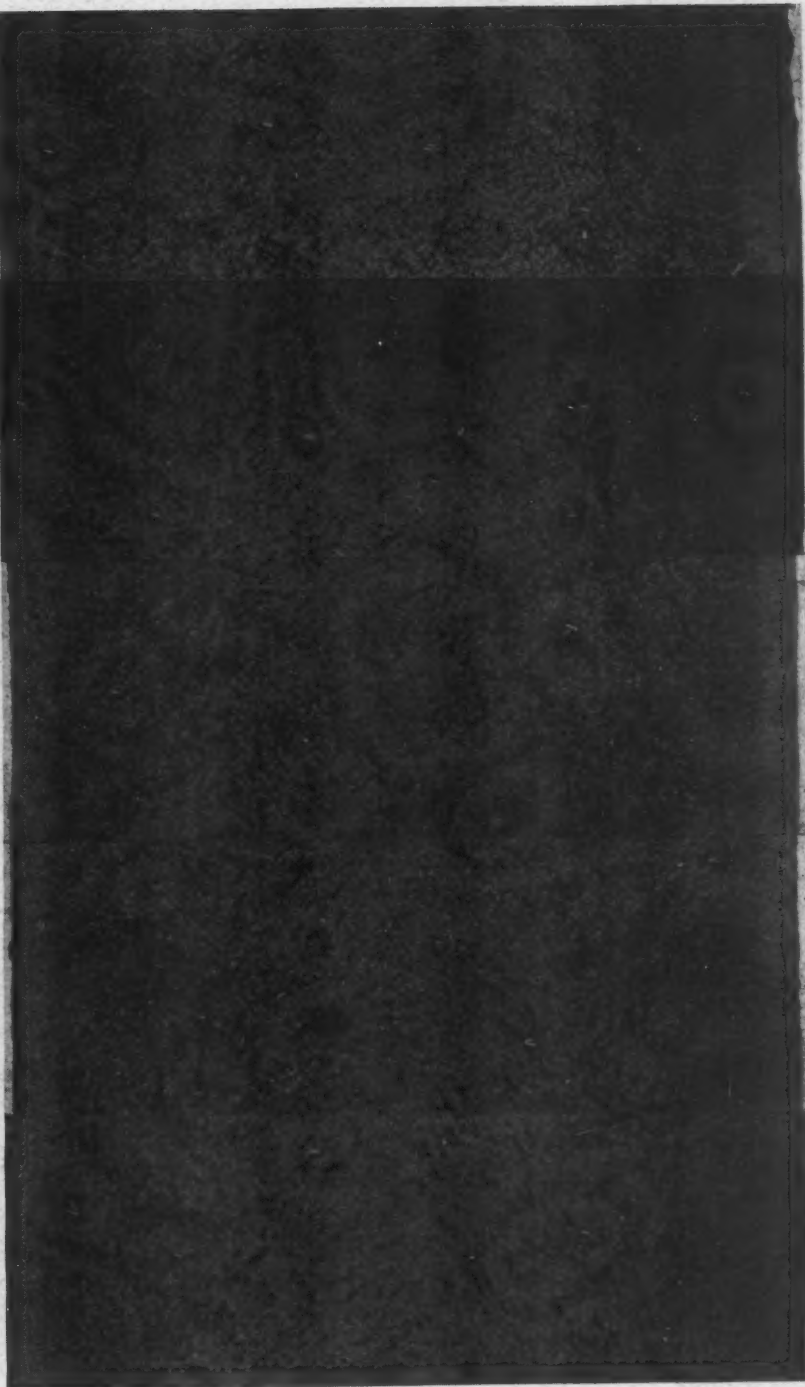


2 Hours



6 Hours

Fig. 24—Macrostructures of cross-section specimens from Plate 1 that have received the various homogenizing heat treatments. Temperatures are given at right and times below each column. Note the gradual decrease in sharpness of the dendrites with increase in time and temperature. All specimens photographed at 2 diameters.



1650°
F.

1750°
F.

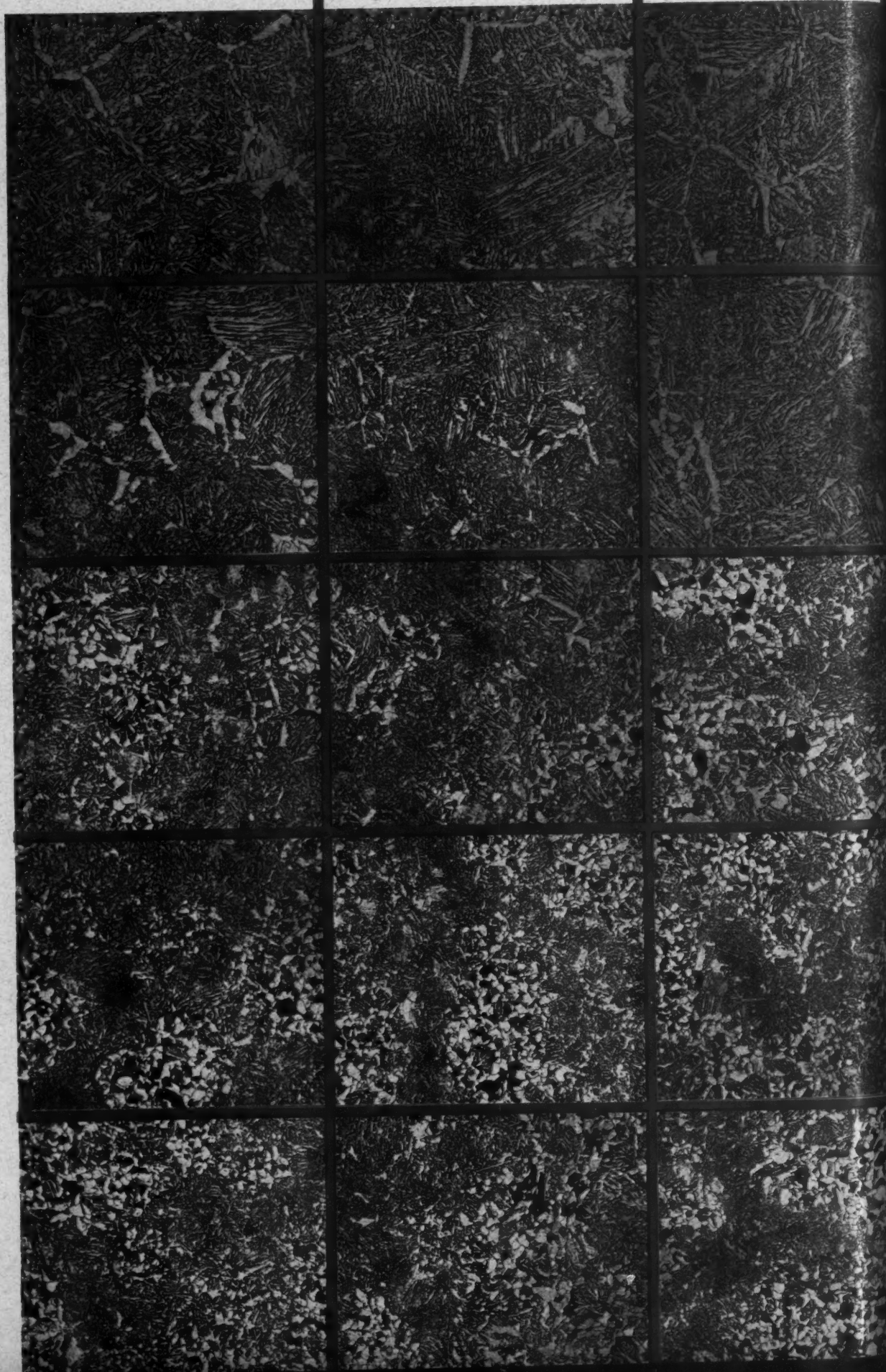
1850°
F.

1950°
F.

2050°
F.

12 Hours

Fig. 26—Photomicrographs show the microstructure of Plate 1 after receiving homogenizing treatments indicated by temperatures given at top of columns and times at right. All specimens nitral etched. X100.





1650° 1750° 1850° 1950° 2050°

Fig. 27—Photomicrographs show the microstructure of Plate 4 after receiving homogenizing treatments indicated by the temperatures given below columns and times at right. All specimens nital etched. X100.



Fig. 28 (left)—Area near center of Plate 4 after quenching and tempering, showing alloy segregation. Note massive carbides and quenching cracks. No homogenization heat treatment. Nital etch. X100.

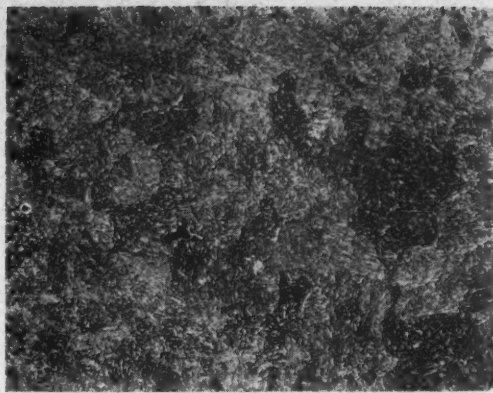


Fig. 29 (right)—Quenched and tempered structure of Plate 4 after a homogenization of 12 hr. at 2250° F. Segregation is no longer visible. Nital etch. X100.

parent in the quenched and tempered microstructure.

10. A tendency toward quench cracks in the air-hardening steel was reduced by the more drastic homogenizing treatments. This improvement was believed to be the result of partial diffusion of areas of high alloy concentration. Other work has indicated that quench cracking may be reduced by a high-temperature (2300° F.) homogenizing heat treatment.

11. The benefits to properties to be derived from a homogenizing heat treatment even as high as 2250° F. are completely overshadowed by the effect of the steel quality (porosity, nonmetallic inclusions, etc.) on properties.

12. Inclusion distribution was not a factor in affecting mechanical properties of these five steels.

13. True diffusion of the dendritic segregation in cast steels, apparently, is realized only by heating for an extended time at temperatures higher than those currently used.

Acknowledgment

This investigation constituted one phase of a research program sponsored by the National Defense Research Committee of the Office of Scientific Research and Development, under the classification—N.D.R.C. Research Project NRC-14. Grateful acknowledgement is made to the Office of Scientific Research and Development for supporting this program and for their permission to publish this information, and to the War Metallurgy Division of N.D.R.C. and the War Metallurgy Committee for supervising and directing the research. Thanks are also due to many members of the Battelle staff for their help, especially to

Dr. C. H. Lorig for his guidance and direction, and to A. R. Elsea for his metallographic studies of the steels.

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DISCUSSION

Chairman: H. H. BLOSJO, Minneapolis Electric Steel Castings Co., Minneapolis.

Co-Chairman: CHARLES LOCKE, West Michigan Steel Foundry Co., Muskegon, Mich.

R. E. KERR¹: During the war, we were producing breech rings in an Ohio steel foundry. One type of breech ring used on bombers called for an extremely thin section with high tensile properties. We used manganese-molybdenum steel and tried homogenizing some of them. We put them in bell-type annealers with large steel rolls at 2000° to 2300° F. for long periods of time, some of them for 20 hr. or more. We cut these rings, machined tensile bars from standard locations, and found little difference in yield strength or tensile strength, but noted a definite improvement in elongation and reduction of area.

C. E. SIMS²: We did considerable amount of work on homogenization treatments of steel in an entirely different field of endeavor, but the results coincide very well with those reported. When

talking about homogenization, we should define what we mean. One can homogenize the carbon very readily, but when it is segregated it is a symptom of alloy segregation.

The best way to determine whether a steel is homogenized or not is to heat it above the critical temperature and cool it slowly, that is, give it a full anneal and see if the carbon distributes evenly or whether it is segregated. If the alloy content of the steel is segregated, the carbon will segregate also, but if the alloy content is evenly distributed, there will be uniform distribution of the carbon. Therefore, when talking about homogenization we are really talking about distributing the alloy which has been segregated because of dendritic segregation during freezing.

It appears that to get true homogenization in practice one must apparently go to an impractical temperature of at least 2200° F. If one uses what might be called a practical temperature below 2000° F., homogenizing requires an impractically long time. It would require probably a week in some cases. But we were able to get complete homogenization with temperatures of 2250° and 2350° F.

* The results on Charpy values and tensile tests were similar to those reported. We sometimes lost a little yield strength and in some steels we gained yield strength, but not to a marked degree. We usually gained something in ductility. There was a small shift in the transition temperature of Charpy bars broken at low temperatures. It appears that any increases obtained in the ordinary mechanical properties of the steel are hardly worth the treatment.

C. R. JELM³: Were these tests made with normalized steels?

MR. SIMS: The tests were made with normalized steels. The benefits are of the same order and magnitude.

J. A. DUMA⁴: Have any tests been made on double homogenizing heat treatments at lower temperature to obtain information on the degrees of effectiveness of homogenization obtained? The authors state that a temperature of 2250° F. is required for optimum homogenization, but on the basis of the microstructures that we have examined, it appears that two low temperature homogenizing heat treatments produce almost the same

¹Pettibone-Mulliken Corp., Chicago.

²Battelle Memorial Institute, Columbus, Ohio.

³Thompson Products Co., Cleveland.

⁴Norfolk Navy Yard, Portsmouth, Va.

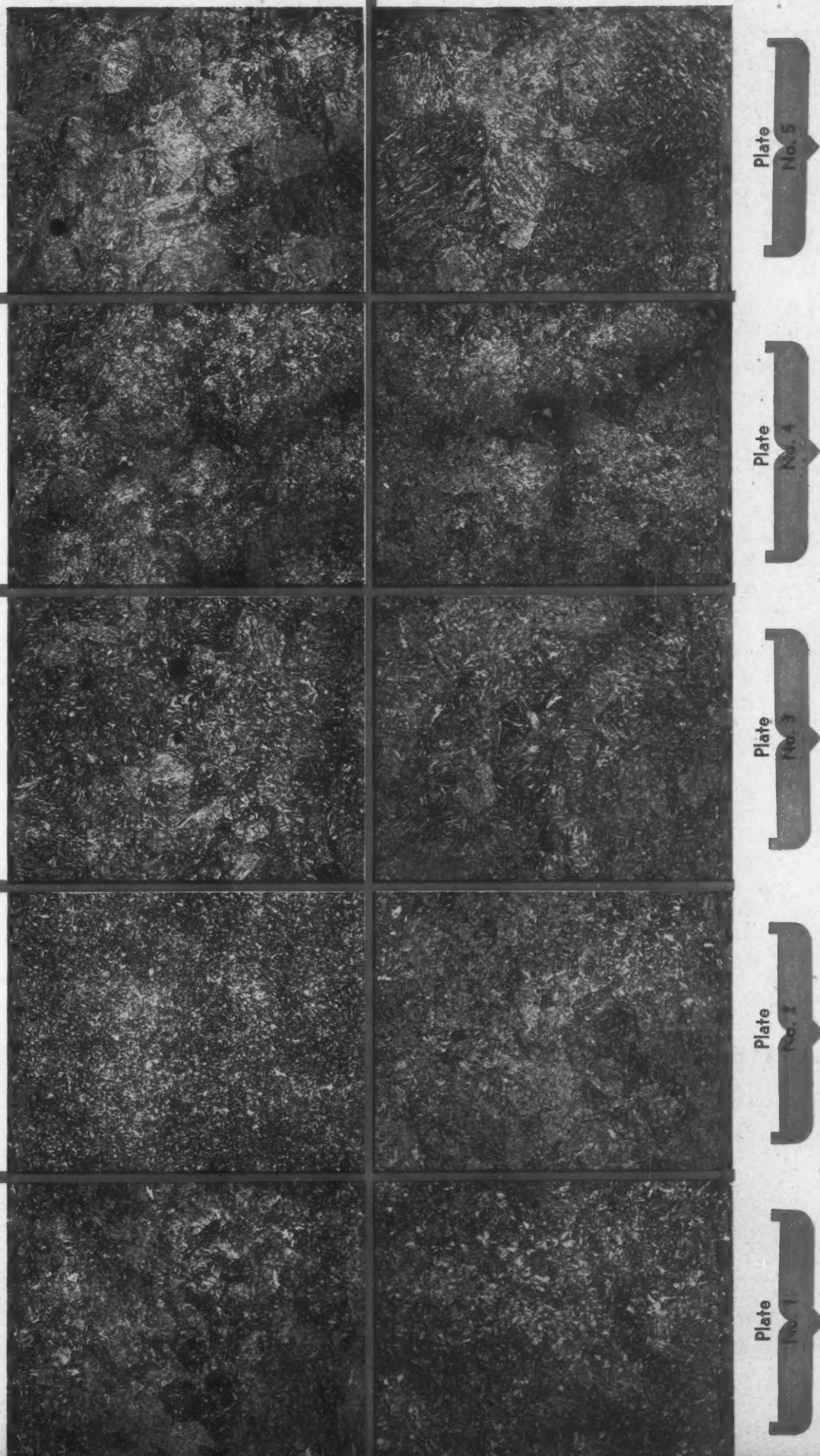


Fig. 30—Top row—Microstructure of the quenched and drawn cast plate specimens which had received no previous homogenizing treatment. Bottom row—Microstructures of the same steels after homogenizing for 12 hr. at 2050° F. followed by quenching and drawing treatments. All specimens nital etched. X100.

results as a single high temperature homogenization treatment.

It is a well known fact in spheroidizing heat treatment practice that the action of repeated passage of the steel up and down through the critical temperature points shortens significantly spheroidization of the iron carbide in pearlitic carbon and alloy steels. It is probable that this action also manifests itself in double homogenizing heat treatments.

MR. KURA: I want to thank Messrs. Kerr, Sims and Duma for their comments. We referred to Mr. Sims' work several times in the paper.

Reference was made to tensile properties of breech rings. You will recall that we discounted our tensile data mainly

because of porosity. A plate is one of the most difficult shapes to cast and make sound. Unfortunately, we cannot make any comparisons of tensile properties as a result of homogenization.

I know of no references to work done on the effect of double homogenizing. I see no difference between homogenizing two or three times at a given temperature, regardless of what that temperature may be, as compared to homogenizing for the accumulated time at the same temperature. I perceive it as somewhat akin to tempering. So far as the end results are concerned, there is no difference between double and single tempering of steels of low and moderate hardenability if the total time at temperature is the same in each case.

1947 Annual Business Meeting of the Association, to be held in Detroit, April 28-May 1, and will name candidates for the offices of National President and Vice-President, and for the directorships that become vacant at the Annual Meeting of the Board of Directors.

Regional Representation

In selecting the nominating group, the A.F.A. Executive Committee takes into consideration the desirability of equitable regional representation, as well as proportional representation for the several divisions of membership. Chapters eligible to have a member on the Nominating Committee in a given year select two candidates with consideration to the branch or division of the industry with which they are affiliated.

Names of candidates are forwarded to the National President on or before July 1; and the Executive Committee makes its selection on or before November 1.

Chapters from whose territory members are selected in a given year are not eligible to have a member on the Nominating Committee for two succeeding years. Thus, 13 chapters were not eligible to submit candidates this year; and the six from which members were chosen cannot be represented on the committee before 1950.

NOMINATING COMMITTEE

Appointments Completed For 1947

APPOINTMENT of the 1947 A.F.A. Nominating Committee by the Executive Committee of the Association's Board of Directors, has been announced by National President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis.

As provided by the By-Laws, the Nominating Committee consists of nine members, two of whom are immediate Past Presidents. At least six members are chosen from eligible candidates submitted by A.F.A. chapters and one may be selected from the membership residing outside chapter territories. The immediate Past Presidents on the 1947 committee are Fred J. Walls, International Nickel Co., Inc., Detroit, and Ralph J. Teetor, Cadillac Malleable Iron Co., Cadillac, Mich.

The members from chapter territories are: Central Indiana, R. S. Davis, National Malleable & Steel Castings Co., Indianapolis; Central Ohio, N. J. Dunbeck, Eastern Clay Products, Inc., Eifort, Ohio; On-

tario, J. J. McFadyen, Galt Malleable Iron, Galt, Ontario; Philadelphia, E. C. Troy, Dodge Steel Co., Philadelphia; Saginaw Valley, M. E. Brooks, Dow Chemical Co., Bay City, Mich.; Wisconsin, H. E. Ladwig, Allis-Chalmers Mfg. Co., Milwaukee.

R. F. Harrington, Hunt-Spiller Mfg. Corp., Boston, has been appointed from the membership outside chapter territories.

Fred J. Walls will serve as Chairman of the Nominating Committee in accordance with the By-Laws.

The Nominating Committee will meet at least 90 days prior to the

Pausing from the busy scenes at the third annual convention of the Magnesium Association, October 3-4 at the Waldorf-Astoria Hotel, New York: left to right, R. J. Cross, Essex Aero, Ltd., Gravesend, Kent, England; Howard Perkins, Brooks & Perkins, Detroit; Edmund Louis, Essex Aero, Ltd.; Major C. J. P. Ball, Magnesium Elektron, Ltd., London, and the newly-elected treasurer and president, respectively, of the Magnesium Association, I. T. Bennett, Revere Copper & Brass, Inc., Baltimore, Md., and R. D. Taylor, Federated Metals Div., American Smelting & Refining Co., New York.



HEAVY GRAY IRON CASTINGS

WELDING

L. J. Larson
Allis-Chalmers Mfg. Co.
Milwaukee

WELDING APPLICATIONS on gray iron differ from those on most other metals. Welding on gray iron has been largely limited to repair and salvage operations. In some cases pads, bosses, and also other more complicated parts, such as brackets, have been added to iron castings by welding. However, the manufacture of gray iron structures by welding together two or more castings is not common practice and, as a result, production procedures have not been developed.

Gray Iron Sensitive

Limited use of welding on gray iron is due, in part, to the difficulty of achieving ideal conditions for making satisfactory welds. Because of its composition, gray iron is sensitive to the effect of heat treatment. If it is heated above its critical temperature and cooled at a rate exceeding about 600 F per minute it becomes hard and brittle, and is easily cracked by stresses caused either by loading or by temperature differentials.

In all of the welding processes, the material adjacent to the deposited metal is heated above the critical temperature for gray iron; hence, the only method of preventing the hardening of this zone is to

retard the cooling rate. The most effective way of doing this is to preheat the adjacent portion of the casting.

Temperature to which the metal must be preheated and the size of the preheated area depend upon the welding process to be used and the size and shape of the casting. Although specific rules governing all cases cannot be given, the following general principles will serve as a guide when repairs of maximum strength are desired:

1. Heat the surface on which metal is to be deposited sufficiently to obtain a good bond between the weld and the parent metal.

2. Heat the area adjacent to the repair sufficiently to prevent hardening in the weld zone.

3. Heat other parts of the casting in such a manner that excessive stresses will not be caused by the welding operation.

A general preheat to a high temperature, about 1000 F, would meet all of the foregoing requirements, but such a preheat is seldom possible on large castings. Furthermore, the welder would not be able to work on castings heated to this temperature. Therefore, a compromise is necessary, and either a lower gen-

eral preheat or a local high temperature preheat is used.

For repairing gray iron castings, a number of methods have been successful. Among these are:

- a. Metallic arc welding.
- b. Oxyacetylene welding.
- c. Carbon arc welding.
- d. Bronze welding.
- e. Thermit welding.
- f. Burning.

Each method has certain advantages and certain disadvantages, and the particular process to be used depends upon circumstances. Sometimes two or more processes may be used on the same casting.

Metallic Arc Welding. For metallic arc welding, either ferrous electrodes (low carbon steel or cast iron), or non-ferrous electrodes (generally monel metal or an equivalent composition) may be used.

Repairing

Preparation for making a repair consists of chipping away any unsound metal and, if the defect is a crack, of chipping a V-groove from one or both sides of the casting. For castings up to about 1½-in. thickness a single V-groove may be used, but on heavier sections a double V-groove is desirable if both sides of the casting are accessible.

The groove should be sufficiently wide at the bottom to permit of proper manipulation of the electrode and should have an included angle of from 60 to 90 degrees. For best results, back chipping to sound metal and welding the second side are essential for both single and double V-grooves. A shear V-groove, which is a V-groove with a wide top, is sometimes used to increase

Many successful repairs have demonstrated the feasibility of welding heavy gray iron castings, the essential factor being the proper selection of a welding process and a method of procedure for the particular application.

Presented at a Gray Iron Welding Session of the Fiftieth Annual Meeting, American Foundrymen's Association, at Cleveland, May 10, 1946.

DECEMBER, 1946

the bonding area between the weld metal and the parent metal.

In most applications of arc welding it is desirable to use threaded studs in the groove. These studs vary in size from 1/8-in. for the thinner sections to 1/2-in. for heavy sections. The studs should be well distributed over the surface of the groove or weld area, spaced at about 1/2-in. for the smaller studs and up to 2 in. for the larger studs.

If the studs are to be fully effective care must be taken to obtain good fusion around and onto the studs, thus attaching the weld metal securely to the studs which, in turn, are anchored into the cast iron below the heat-affected zone. Without the use of studs, arc welds may pull away from the parent metal, as shown in Fig. 1. Cracks such as those shown in this specimen generally occur in the heat-affected area and are not due to lack of fusion between the weld metal and the cast iron.

With the metallic arc process, pre-



Fig. 1—Metallic arc weld with coated steel electrodes and no preheat. $\times 1$.

heating of the base metal in order to obtain fusion between it and the deposited metal is not required, but hard spots in the weld area will occur if preheat is not used. Figure 2 shows the results of hardness surveys on single-bead welds made with two ferrous and two non-ferrous electrodes, with no preheat, and with 500 and 1000 F preheats. The curves at the left show the hardness in the heat-affected zones, and

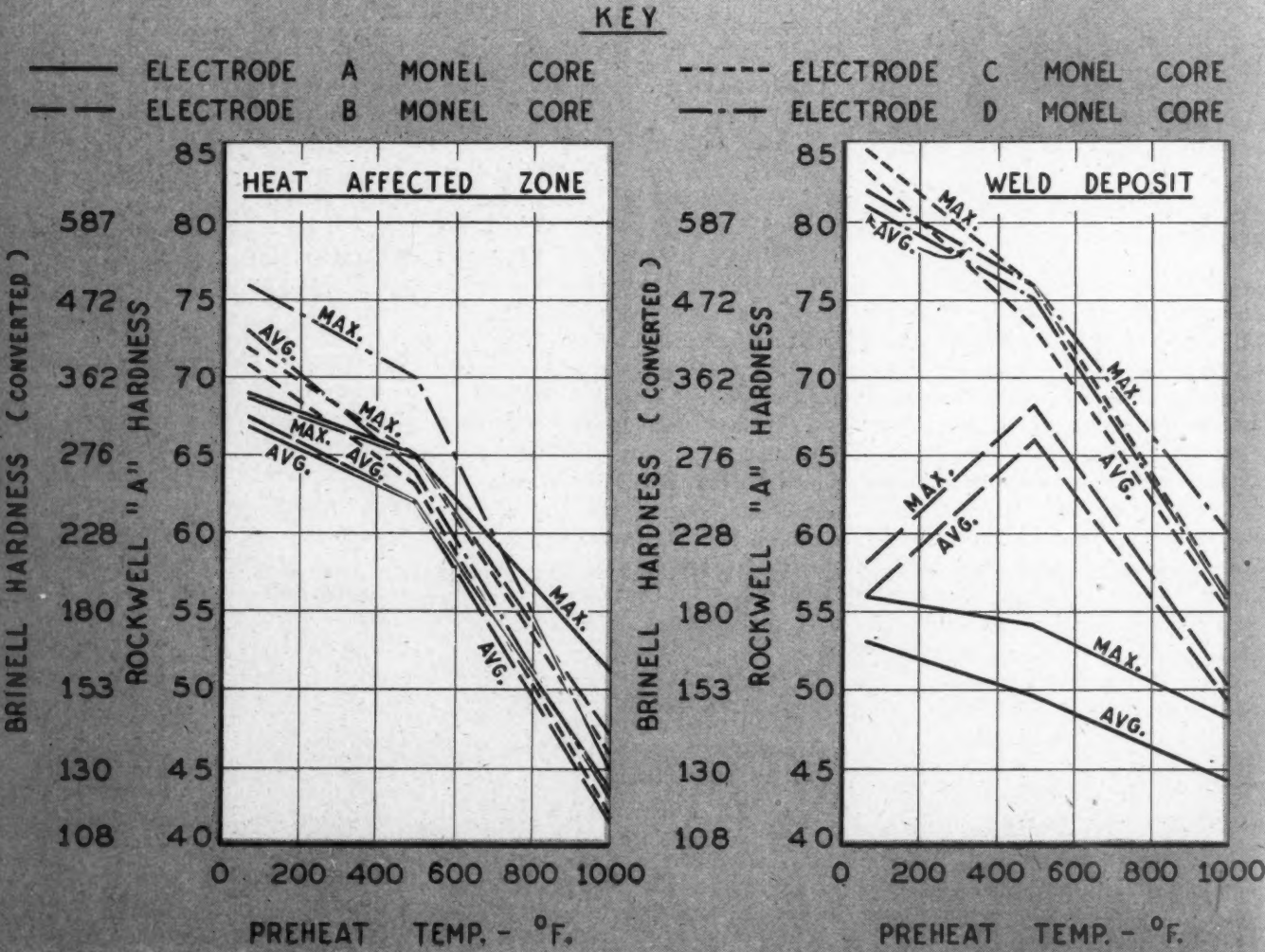
Fig. 2—Curve showing hardness values of single-bead metallic arc welds.

those at the right the hardness of the weld deposits.

As might be expected, all of the electrodes produce high hardness in the heat-affected zones when no preheat is used. The values are somewhat higher for the ferrous than for the non-ferrous types of electrodes, but the difference is not great. At a preheat of 500 F the hardness values, with one exception, are between 245 and 275 Brinell for all electrodes, and at the 1000 F preheat all hardness values are below 160 Brinell.

Hardness values of the weld deposit show a marked difference between the ferrous and non-ferrous types of electrodes. With steel electrodes the hardness is above 400 Brinell for preheats of 500 F or less, and between 190 and 225 Brinell for a 1000 F preheat. The monel type electrodes show values below 210 Brinell for all preheats except one electrode at 500 F, which has a maximum hardness of 320 Brinell.

With multipass welds, both the



weld deposits and the heat-affected zones are softened materially by the heat of subsequent layers, but this does not eliminate the danger of cracking in the hardened areas before the next layer is deposited. Even with a preheat of 500 F, multipass welds made with either ferrous or non-ferrous electrodes may develop cracks, as is shown in the photomicrographs (Figs. 3 and 4).

Weld Strengths

To determine their strengths, welds of several types were made in standard gray iron castings such as that shown in Fig. 5. This shape of casting was chosen because it offers some restraint to the shrinkage of the weld. The strength values for the welds were obtained from tension specimens located as shown in the upper part of Fig. 6. The numerical values shown in the lower part of Fig. 6 apply only to a particular bronze weld.

Metallic arc welds were made with ferrous and with non-ferrous electrodes with no preheat and with a preheat of 500 F. Since it was desired to determine the strength of the junction of the weld to the cast iron, no studs were used.

With no preheat the welds pulled away from the cast iron, as shown in Fig. 1, and no tension tests were made. With a preheat of 500 F the weld made with the ferrous electrodes had a tensile strength of 11,000 psi across the junction and 49,000 psi for the deposited metal. The corresponding values for the weld made with the non-ferrous electrodes were 12,200 and 70,000 psi, respectively.

Structure Distortion

Metallic arc welds were not made with a preheat of 1000 F since other welding processes are generally preferred if this amount of preheat is permissible.

The fact that fusion onto the base metal can be obtained without preheat with the metallic arc process leads to its use on structures in which distortion must be kept at a minimum, and for which maximum strength of the repair is not required. Cast iron cylinders of low pressure steam turbines are structures of this type.

After years of service the material between the blade grooves

Fig. 3—Crack in heat-affected area and weld deposit (right) of metallic arc weld with steel electrodes and 500 F preheat. $\times 100$.



often corrodes sufficiently to impair the support for the blades. The corroded areas are built up by welding without preheat since distortion of the cylinder would render it useless for further service.

The areas to be repaired are studded with $\frac{1}{8}$ -in. screws, and lightly coated monel electrodes are used. By depositing only short beads and skipping around to different parts of the cylinder it is kept sufficiently cool to touch with the hand. Cylinders have been repaired by this method for more than 20 years and rewelding has never been necessary. The improved life after welding is due to the superior corrosion resistance of the monel metal deposit.

When the distortion resulting from a moderate preheat is not serious but a high preheat is objectionable, metallic arc welding may be used with a preheat of about 500 F. This results in a repair with sufficient strength for many structures, especially if studs are used. Such welds, made with non-ferrous electrodes, are machineable.

Gas Welding

Oxyacetylene Welding. Oxyacetylene welding or gas welding, as it is frequently called, is done with the oxyacetylene torch adjusted to a neutral or slightly carburizing flame. Cast iron filler rods having about 3.5 per cent carbon and 3.0 per cent silicon are suitable, and a cast iron welding flux is used.

For repairing cracks in castings, a V-groove similar to that used for arc welding is prepared. The groove need only be wide enough to permit proper manipulation of the welding torch, and studs are unnecessary.

Parent metal around the weld area is generally heated to 1000 F or more to speed up the welding operation. This may be done with a charcoal fire or with large gas or oil burners. Hardening is not a prob-

Fig. 4—Crack in heat-affected area of metallic arc weld with monel electrodes and 500 F preheat. $\times 100$.

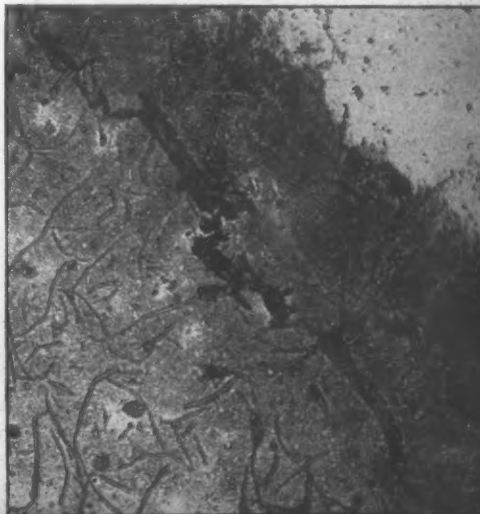
lem in the case of gas welding since the heat required to obtain proper fusion will raise the temperature of the adjacent metal sufficiently to prevent the weld area from cooling faster than the critical rate.

Size and shape of the preheated area are determined by the shape of the structure being repaired, the object being to heat it in such a manner that the structure will not be subjected to excessive thermal stresses during heating or cooling.

Flux is sprinkled in the groove and the local area at which the welding is to be started is heated to the melting temperature. The filler wire, dipped in flux, is heated to a red heat and rubbed onto the fused area. With continued heating a pool of molten metal is formed, and the tip of the filler wire should be kept submerged in this pool.

If the filler wire is melted and allowed to drop into the pool, slag inclusions and porosity are likely to result. Working the filler wire in the molten pool helps to float out the slag. Care must be taken to melt the parent metal ahead of the molten pool in order to obtain good fusion. Flux is added as the welding progresses.

After the welding is completed the structure should be covered so



as to cool slowly. Stress-relieving at temperatures of 1100 to 1200 F is beneficial, especially if the structure is rigid.

An oxyacetylene weld, properly made, will have a structure similar to that of the parent metal except that the grain size will be smaller. Figure 7 shows the junction between an oxyacetylene weld and

parent metal without difficulty, preheating is not required in order to obtain fusion. However, preheating is necessary to prevent the heat-affected area from hardening and cracking, just as in the case of metallic arc welding. The weld area should be heated to about 1000 F, and the surrounding area heated sufficiently to prevent excessive temperature stresses. After the weld is completed the casting should be covered so as to cool slowly.

Welds made by this process will be easily machineable and the color of the weld metal will be the same as that of the casting. If the welding is properly done the strength of such welds will be satisfactory, but it is more difficult to control this

welding procedure than it is that of the gas welding method.

Bronze Welding. This welding process or brazing is similar to gas welding except that a brass filler wire of approximately 60 per cent copper and 40 per cent zinc composition is used in place of the cast iron filler wire. The oxyacetylene flame adjusted to be slightly oxidizing is used as a source of heat. It is recommended that two types of flux be used, a "tinning" flux for coating the surface of the cast iron and a welding flux for the remaining brazing operation. These fluxes are commercially available.

For repairing cracks in castings, a V-shaped welding groove, similar to that used for arc and gas welding, is

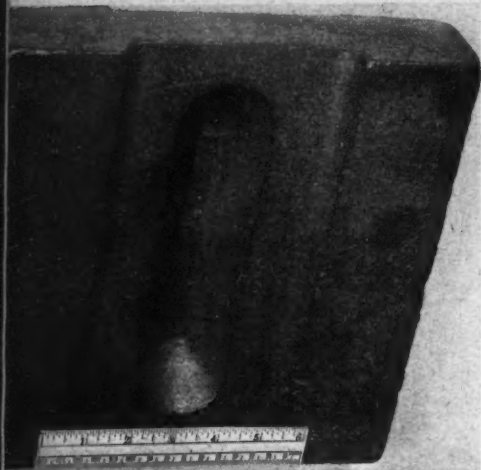


Fig. 5—Cast iron plate used for welding and brazing tests. This type of casting was selected because it offers some restraint to shrinkage of the weld.

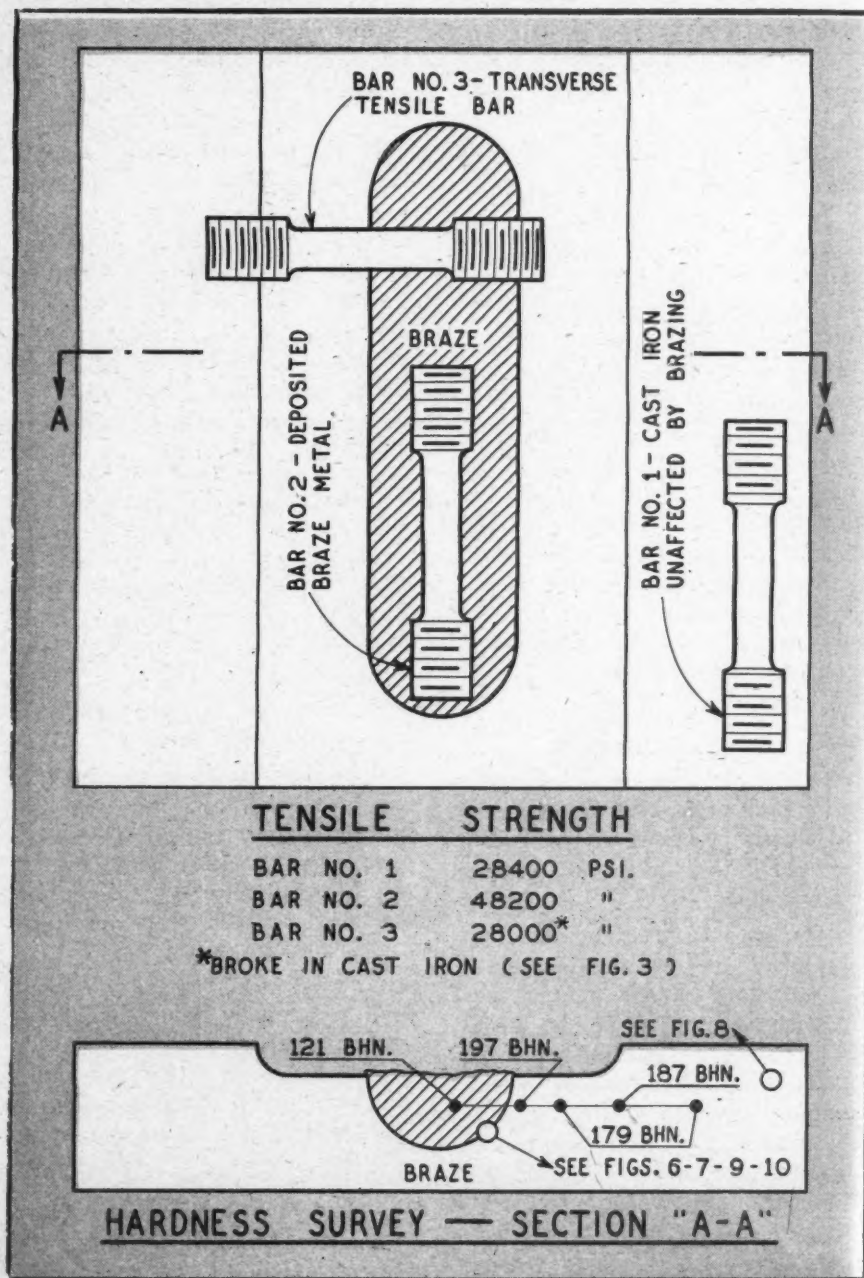
gray iron. The strength of the deposited metal corresponds to that of cast iron of a similar analysis and, if the welding procedure has been carried out so as to obtain proper fusion, the joint will have a strength approximately equal to that of the parent metal.

Oxyacetylene welds with cast iron filler rod have the same color as the parent metal, which is sometimes important, especially when the repair is to be machined.

Carbon Arc Welding. Although this is an arc welding process it resembles oxyacetylene welding since the same types of filler wire and flux are used. However, an arc between carbon or graphite electrodes and the work is used to furnish the heat necessary for making the weld.

Inasmuch as the heat of the arc is sufficiently intense to melt the

Fig. 6—Layout showing location of tension specimens cut from test plates, and physical properties of brazed joint.



used. This groove should be chipped rather than ground because grinding tends to coat the cast iron with graphite which interferes with the brazing process. Cleaning with a wire brush is helpful, and excess graphite may also be burned off with an oxyacetylene torch adjusted to an oxidizing flame.

Preheat Developed

The weld area is preheated by any convenient means in order to speed up the welding operation. As in the case of oxyacetylene welding, the bronze welding operation develops sufficient preheat in the material adjacent to the welding groove to prevent hardening of the heat-affected area.

Some of the tinning flux is sprinkled into the groove and a small area at the point where the weld is to be started is heated to a temperature slightly above the melting temperature of the brass filler rod, which is about 1650 F.

Behavior of the brass on the cast iron indicates when the proper temperature has been reached. If the cast iron is too cold, the brass does not spread out or "tin" the surface, and if the temperature of the iron is too high the brass collects in little balls on the surface of the cast iron. The fact that bronze welding is done at a temperature of several hundred degrees below the melting point of cast iron is an advantage in favor of this method of welding.

The welding groove must be tinned with brass ahead of the weld to insure that the deposited metal will not be cast in the groove without fusion. When tinning is properly done the brass penetrates between the grains of the iron, as shown in Fig. 8 at $\times 25$, and in Fig. 9 at $\times 100$.

Proper "Tinning"

The result of improper tinning is shown in Fig. 10 at $\times 25$. In this case will be noted not only a lack of intergranular penetration of the brazing material but the presence of an oxide film between the two surfaces. Obviously, under this condition a satisfactory joint is not obtained. After the groove is tinned the weld is built up in layers until complete, and the casting is then covered and allowed to cool slowly.

A bronze weld, properly made, results in a repair which is as strong as the casting. As may be seen from values given in Fig. 6, the bronze deposit had a tensile strength considerably greater than that of the gray iron, and the transverse specimen had a strength equal to that of the parent metal. Figure 11 shows the transverse specimen, with the weld at the right and the fracture at the left about 2 in. from the edge of the weld.

From the standpoint of strength, bronze welding is one of the best methods of repairing gray iron, and the chief objection to this method of repair is that the color of the weld

Reading from top to bottom:

Fig. 7—Oxyacetylene weld (right) with cast iron filler wire in gray iron test plate. $\times 100$.

Fig. 8—Junction of bronze weld in gray iron. Good brazing procedure. $\times 25$.

Fig. 9—Junction of bronze weld in gray iron. Good brazing procedure. $\times 100$.

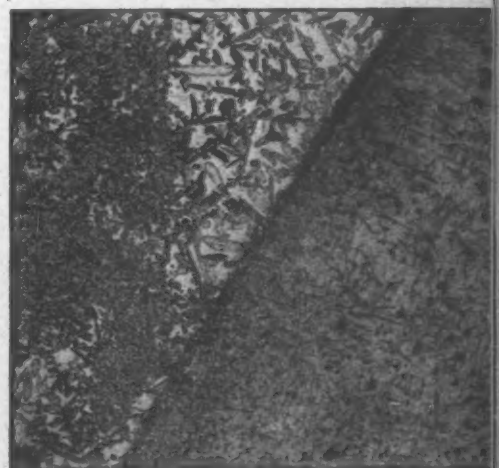
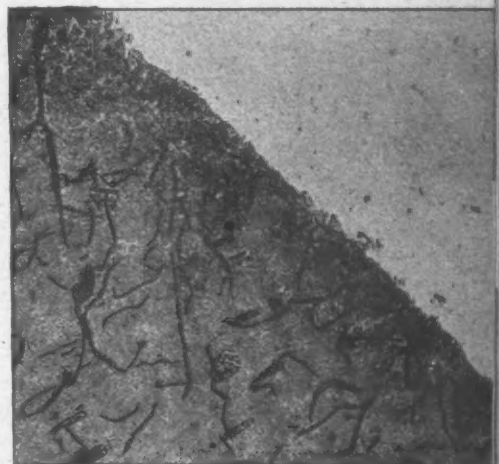
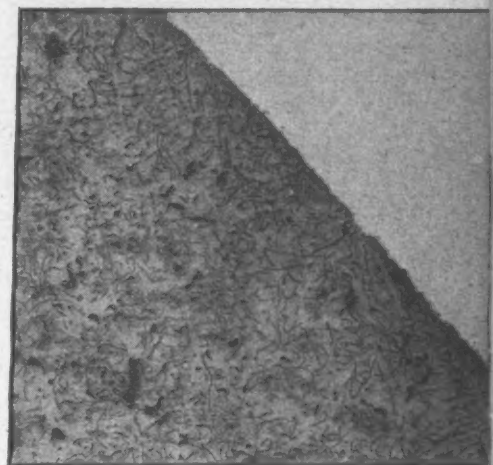
Fig. 10—Junction of bronze weld (right) in gray iron. Improper tinning procedure. Note outside film at junction. $\times 100$.

does not match that of the parent metal.

Thermit Welding. The thermit welding process for gray iron is similar to that for steel except that a cast iron thermit mixture is used for gray iron. The process is used for making repairs on many types of structures, but is not suitable for welding long cracks in thin sections or for welding cracks which extend only partially through a section.

However, in the latter case, it may be feasible to cut the remaining portion of the section and make a complete weld. According to the manufacturer's recommendations, the process should not be attempted if the length of the crack exceeds about eight times the thickness of the material because the shrinkage of thermit iron is about twice that of gray iron.

Transverse cracks are likely to de-



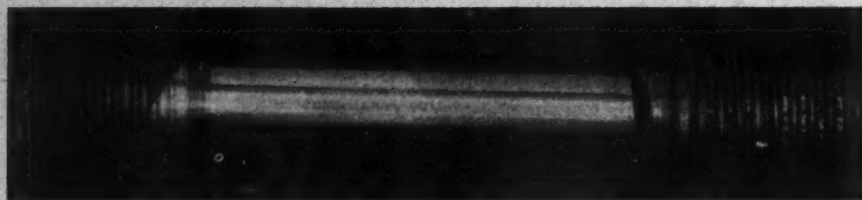


Fig. 11—Fractured transverse tension specimen from bronze weld.

velop when the length of the section is too great in proportion to its thickness. If the section is compact there is practically no limit to the size of sections which can be successfully welded.

Preparation for thermit welding is simple. The ends of the broken member are machined or otherwise cut so as to form a parallel-sided gap at the section which is to be welded. The width of the gap increases with the size of the section, and tables are available showing the proper gap for various cross sections. After the preparation is completed, the broken pieces are set up in alignment with proper allowance for shrinkage and a wax pattern is made to conform to the desired shape of the casting after completion of the weld.

A mold box of suitable size is then set in place around the broken member, and this is filled with thermit molding material with the various gate and riser patterns in their proper positions. After the molding material has been rammed into place the patterns are removed. Figure 12 shows a typical setup for making a thermit weld.

When the mold has been completed the ends of the casting next to the gap are preheated to a red heat with a kerosene-air burner through the gates provided for that purpose. The preheating melts out the wax pattern. In the meantime the pouring crucible is set in position above the mold and the correct amount of thermit mixture is placed in the crucible.

Preheating Weld Area

When the preheating is completed, the preheating gates are plugged and the thermit mixture is ignited with a special powder. The time of the thermit reaction is independent of the amount of thermit metal in the crucible, and is about 30 sec.

As soon as the reaction is completed, the crucible is tapped and the molten metal flows into the space formed by the wax pattern, while the slag from the reaction fills the slag basin in the mold. The superheat in the thermit metal is sufficient to melt some of the iron adjacent to the gap, thus insuring a bond between the added metal and the parent metal of the original casting.

Weld Metal Properties

The thermit metal is slightly harder and tougher than the original gray iron, but the joint can be machined. Welds made by this process have low lock-up stresses and stress-relieving is not necessary unless the repaired member is a part of a frame or rigid structure.

Thermit welds made on gray iron sections suitable for the process have shown satisfactory service records.

Figure 13 shows a thermit repair weld in a press frame.

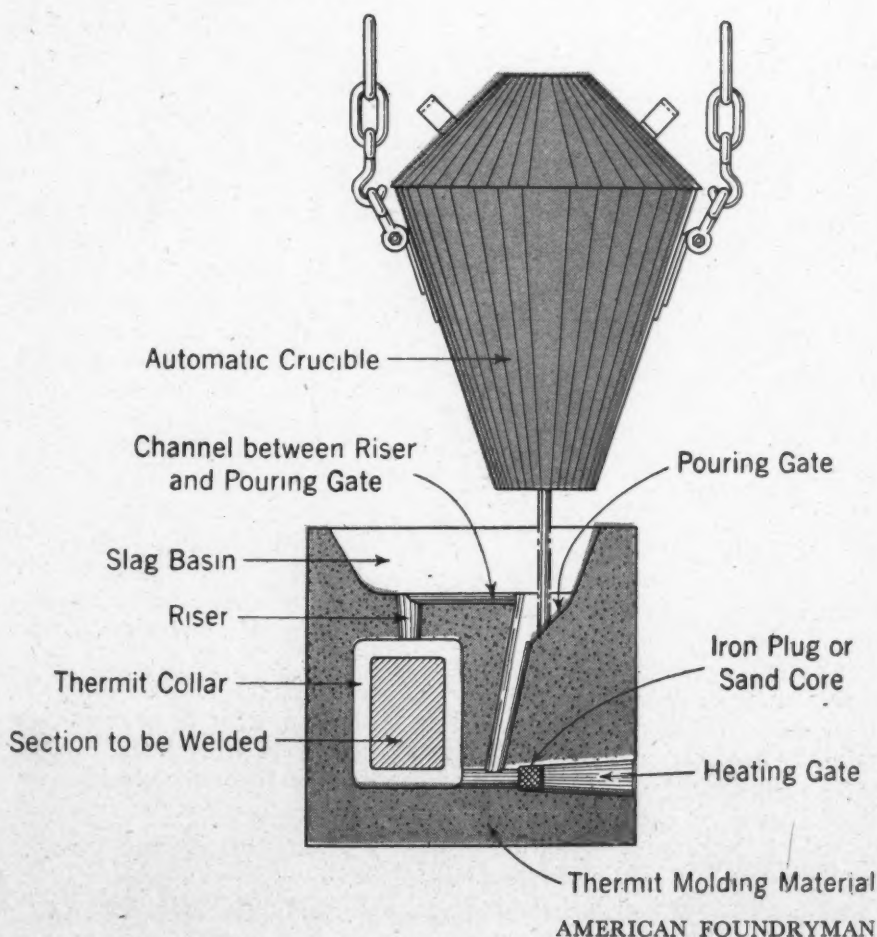
Burning. Although "burning" is not generally classified as a welding process, it is one of the accepted methods of repairing gray iron castings, and also of adding parts to finished castings. Basically, it is quite similar to thermit welding except that the molten metal for making the burn is obtained from a cupola.

Casting Preparation

The casting is prepared by chipping or other means and placed in position so that the crack or area to be repaired is in a horizontal plane. A dam of loam sand is built up around the area so as to form a well with an opening at one end to provide flow-off for the excess metal. If the repair extends through the full thickness of the casting, refractory material is built up below the opening to act as a retainer for the molten metal.

The area of the casting around the repair area is preheated to a temperature of 400 to 500 F by a charcoal fire or other convenient

Fig. 12—Setup for making thermit weld.



means. Molten cast iron of a suitable composition is taken from a cupola and poured onto the weld area or crack in such a manner as to heat the casting in the entire area to be repaired.

Pouring is done slowly and continued for one to two minutes, allowing the excess metal to run out through the flow-off in the dam. Pouring is then interrupted for a short time, perhaps a minute, to allow the heat to soak into the casting, and then resumed for a short time. This alternate pouring and waiting is continued until the area to be repaired is heated above the melting temperature and proper bonding between the added metal and the metal of the original casting takes place.

The metal used for pouring should be at a temperature of about 2800 F, and the pouring should not be

done after the temperature drops below 2500 F. Otherwise, too much molten metal is required to heat the casting to the fusion temperature. After the pouring is completed, the casting is covered to permit slow cooling.

Added Metal Properties

Physical tests of metal produced by burning show that the properties of the added metal are practically the same as those of cast material of the same analysis. The microstructure of the added metal is similar to that of gray iron except that the added metal has a finer grain structure.

Figure 14 shows junction of burn metal at right and parent metal at left. If the process is properly carried out there will be no hard spots in the added metal or in the casting adjacent to the repair.

The burning process results in a repair which is similar in composition to the original casting. Therefore, the repair matches the casting

in color after machining. Since the burning process requires molten metal from a cupola, its use is generally limited to repairs made in the foundry.

After completing the repairs with any of the foregoing processes, the question often arises, "Is stress-relieving necessary?" The answer depends upon several factors. Structures which are welded with the "cold" arc welding process to prevent distortion, such as the turbine cylinder discussed, cannot be stress-relieved because to do so would cause distortion. Rigid structures which are welded with a high local

Fig. 13—Cast iron punch press frame repaired by thermit welding.

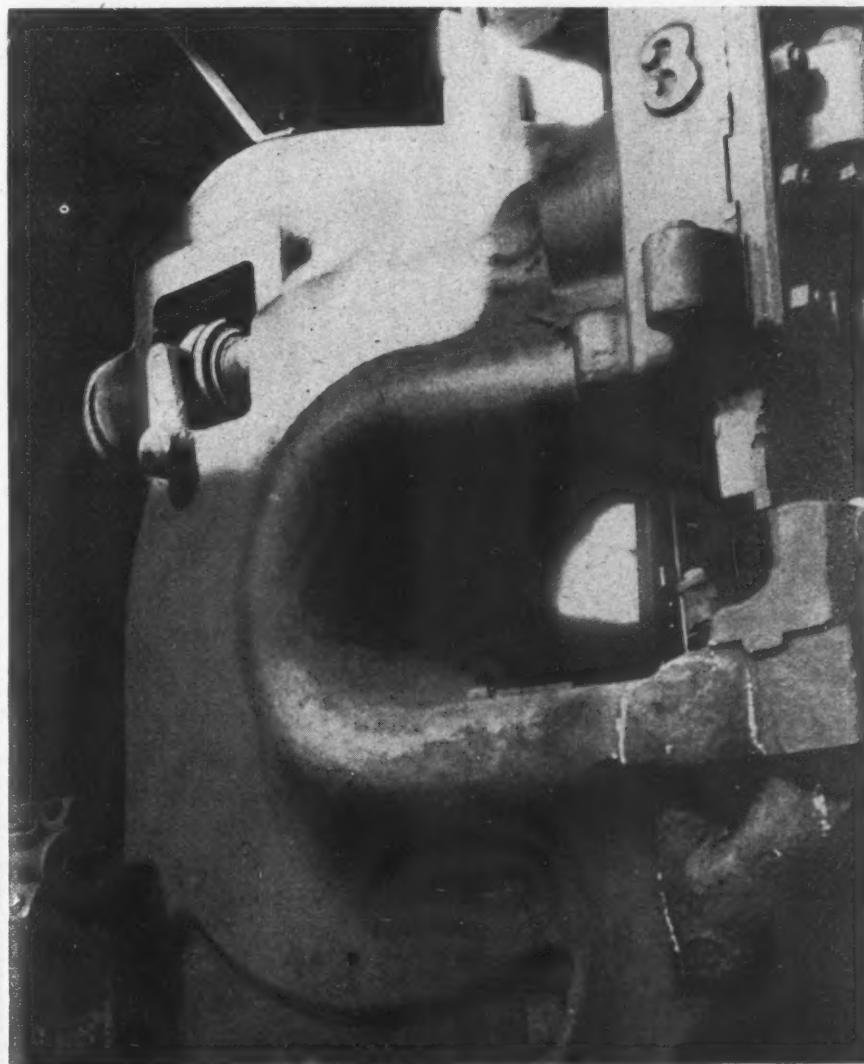


Fig. 14—Junction of "burn" metal (right) and gray iron. $\times 100$.

preheat and which require high strength should be stress-relieved if possible.

If a structure is not rigid and the entire heated area can expand and contract freely, then stress-relieving is not necessary. Many structures repaired in the field cannot be stress-relieved; therefore, the metallic arc process and a moderate preheat are used even though the resulting welds do not have a strength equal to that of the casting.

An example of a large cast iron structure which was successfully repaired by welding is the four-section, 252-in. water box shown in Fig. 15. While machining the flanges on these castings, four cracks were found at the outer corners of the castings comprising the water box.

Three of the cracks extended

through the thickness of the flange, and one of these also extended about 14 in. into the side wall along the inlet opening. In the faces of the flanges were a number of shrink cavities, some being as great as 2 in. in depth.

Method Selected

It was decided to use bronze welding for the cracks in the flanges, since this would insure repairs of high strength and color match was not important. Inasmuch as the cracks were at the corners of the sections the expansion due to high preheat could take place without causing high stresses in the casting. Figure 16 shows the crack which extended into the side wall after chipping for welding. Figure 17 shows the outside and Fig. 18 the inside of the completed bronze weld.

The shrink cavities in the flanges were welded with the metallic arc,

using monel electrodes and a low preheat. Threaded studs of $\frac{1}{8}$ -in. diameter for the smaller cavities and $\frac{1}{4}$ -in. diameter for the larger cavities were used.

This method was chosen because these repairs are not subjected to high stresses and, therefore, metallic arc welds have sufficient strength. Also, the preheat required for the other welding processes would have produced high stresses in the side wall. Figure 19 shows one of the cavities after chipping and studding.

Stress Relief After Repairs

The sections were stress-relieved after all the repairs had been completed. No difficulty was encountered in machining these sections and no trouble has developed in service.

Use of welding to repair these castings was of prime importance in several respects. Without welding it would have been necessary to re-

Fig. 15—(below)—Four-section cast iron water box on 40-ft mill for machining.

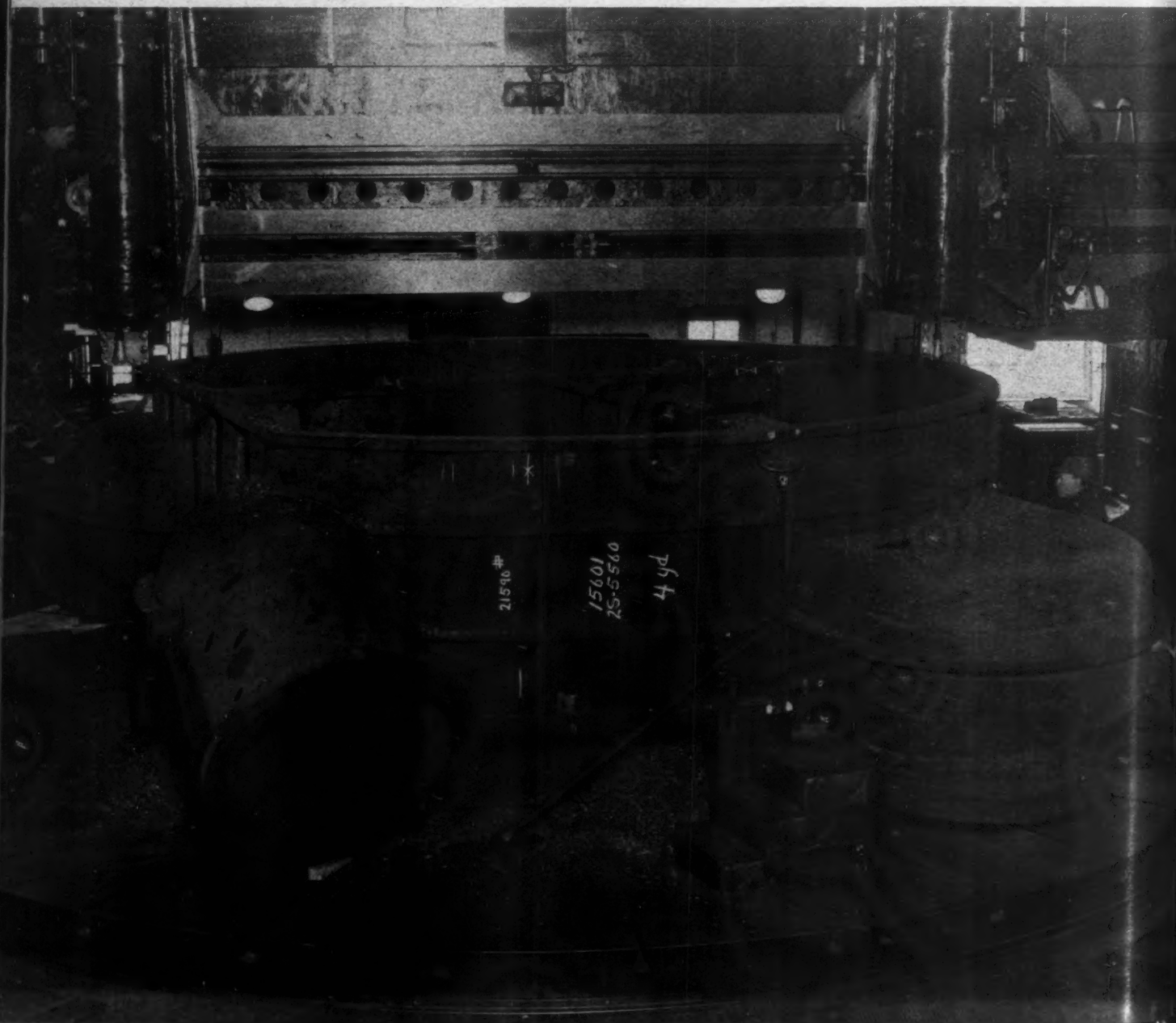
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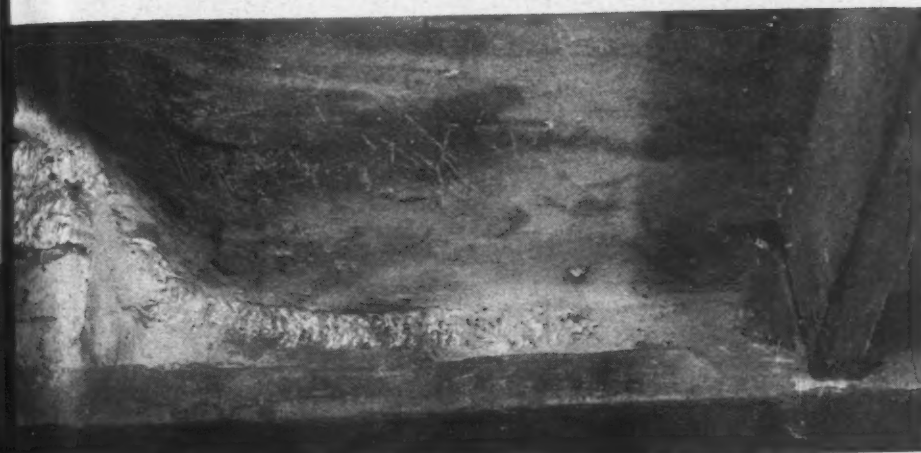
Fig. 16—Crack in flange and side wall of water box. Chipped for bronze welding.

Fig. 17—Bronze repair weld of crack shown in Fig. 16.

Fig. 18—Bronze weld shown in Fig. 17 viewed from inside of water box. Inlet opening appears at right of repair.

Fig. 19—Cavity in water box flange chipped and studded for metallic arc welding.





place three of the sections at considerable expense. More significant, however, is the fact that the replacement would have tied up foundry facilities needed for war production and delayed the installation of equipment which was urgently needed.

Acknowledgment

The author wishes to acknowledge with thanks the photographs furnished by the Metal and Thermit Corp., and the assistance of his colleagues, particularly H. O. Quartz, W. A. Hambley, and G. W. Leupold, in furnishing information and preparing specimens.

DISCUSSION

Chairman: E. C. JETER, Ford Motor Co., Dearborn, Mich.

Co-Chairman: JOHN CROWE, Air Reduction Sales Co., New York.

CO-CHAIRMAN CROWE: How do you clean out the castings for welding? In general, what preparations are made for welding?

L. J. LARSON¹: In preparation of castings for welding we generally remove the metal by chipping. It is possible to remove most of the metal by "burning out" with a metallic arc. In some cases the groove may be burned out with a metallic arc and then chipped to finish the preparation. In view of the value of the casting we generally consider the extra time required for chipping is well worth while in order to obtain the best preparation for welding.

CO-CHAIRMAN CROWE: Do you know whether anyone is removing the defects with the oxygen jet? If not, why not? Is that not a practical means of removing defects?

MR. LARSON: It is my understanding that oxygen cutting and gouging do not work successfully on cast iron because cast iron is not readily oxidized.

CHAIRMAN JETER: Discussing welding of castings in a general way, there has been much misunderstanding between the foundries and the consumers about welding. As a result, some of the foundries perhaps tried to hide whatever repairs they might make to castings. It would have been better to bring it out in the open and show what was being done.

The A.F.A. is trying now to publish the facts about welding of castings so that foundries and consumers know what is being done and understand each other. The S. A. E. War Engineering Board, together with the Ordnance Department, have accomplished a great deal in this direction, but it is up to the A.F.A. to carry on and make available to every foundry and consumer information as to correct procedure for welding and repairing of castings.

¹Allis-Chalmers Manufacturing Co., West Allis, Wis.

CASTINGS INDUSTRY NEEDS VOCATIONALLY COMPETENT MEN

Bruce L. Simpson
President
National Engineering Co.
Chicago

THE CASTINGS INDUSTRY recognizes the importance of public schools in the field of vocational training. However, the foundry industry is of the opinion that the amount of occupational training provided by public schools is negligible when compared to the actual need of industry. The inadequacy of training for the foundry field probably has a parallel in other fields of industry in which the educational needs of workers are not being satisfied.

Consider these situations: That automobile production is behind schedule is not due to strikes alone. Bathtubs and sanitary ware for badly needed buildings are far behind in production. Farmers cannot get new tractors and other agricultural equipment although the world need for food is the greatest in history. Why? One important reason is to be found in the shortage of castings, particularly gray iron and malleable castings.

These are not isolated cases; shortages exist in many industries. A basic reason for this condition is that American boys are not being trained adequately and in sufficient numbers to man the plants.

Vocational training programs in the public schools and apprentice programs in industry are main sources of trained workers. In the castings industry, apprentice training offered by the plants has provided

90 per cent of the skilled workers and the leadership. The apprentice system has been hampered, however, by continuation of the draft, with the result that fewer men are being trained.

Accordingly, the castings industry must and does look to the schools to train an increasing number of its future employees. The type of training, however, must be based on the needs of the foundries and their ability to provide job opportunities.

The returned serviceman must be encouraged to come into an industry which needs, wants, and must have trained men. Schools which are not doing so should aid veterans to return to their old jobs, or to take up new ones in foundries, by offering refresher courses.

Industry Not Understood

It is not entirely their fault that vocational schools have not done a better job for the metal casting industry. In part, the condition results from a misunderstanding of the needs of our industrial society.

All industry needs the support of

educational leaders, but the castings industry, at best, is poorly understood by the American public, and particularly by the teaching profession. This misunderstanding is not wholly the fault of the educator. Rather, it can be laid in great part at the doorstep of the industry, which has neglected to tell its story.

Little has been said, outside of the industry, of the importance of metal casting enterprises. Few have explained their basic nature. Yet civilization, as we know it, simply could not exist without castings.

The public does not seem to be aware of the fact that the castings industry has fewer accidents than most heavy industries. A number of industries, manufacturing and non-manufacturing, rate much higher in severity and frequency of accidents. Because of the development of A.F.A. CODES OF INDUSTRIAL HYGIENE AND SANITATION, foundries pay more attention to these important considerations than do many other industrial plants.

Few have taken the trouble to tell the public that the average hourly

► One method of developing leadership was discussed by J. E. Goss in an article entitled "Skill and Leadership Through Apprentice Training," which appeared in the October issue of *American Foundryman*. The castings industry recognizes that schools can play an important part of the training necessary to provide

supervisors and foremen for the future. In this adaptation of an address by A.F.A. National Director Bruce L. Simpson, cooperation of the industry is promised and a program for schools is presented. Vocational schools and chapter educational committees are given helpful suggestions for improving school-industry relations.

earnings of foundry workers is well above the median in American manufacturing establishments. The public does not realize that advancement in foundries for alert, qualified job holders is rapid. Nor is the public aware that the castings industry has made more progress in the development of work-easing machinery in the past fifteen years than in all its more than six thousand years of history.

How are the educators and the public supposed to know, when the real facts are kept from them, that the cold, dirty, wet, and uncomfortable foundry of 1910 is generally no longer in existence or permissible? Only if they are told, can they be expected to know that the foundry is a good place to work.

More Publicity Promised

The castings industry has done a poor public relations job. The result is that many who would normally enter foundries and embark on a successful career have decided to follow other occupations. Recently, however, the industry has done a better job of keeping the public informed, and in the future it will increase its effort.

Part of the responsibility for informing the public and much of the obligation for establishing training in a field where there is such great opportunity lies with the schools.

Schools can perform a great service to the people whom they train, the community, and industry by keeping up to date in their knowledge of industrial need and opportunity, and by formulating a program to meet the situation.

Teacher Is Key Figure

The teacher often provides the inspiration that gives our young men and women the desire to be affiliated with one or the other of our great American industries. Without new additions and a fresh point of view being injected at the root of the trade, the top will soon wither and die.

No trade or plant is better than its apprentices, and unless foundries are provided with skilled men the entire craft will die. Men brought into the foundry field must be able to assist in, and eventually carry on, the work of those who have mastered and ably carried the tremendous technical and managerial load of the castings industry.

Opportunity in any given craft should be of prime importance to the educator when he establishes training and offers vocational guidance. The place of the industry in national and local well-being and the opportunity to the person entering

the field are factors which should be carefully considered.

History indicates that nations with active, well-staffed foundries have been progressive and prosperous. This is especially true in America. Unless, however, the vocational education field accepts its responsibility to offer and encourage the effective training so vitally needed in the castings field, the entire industry is in danger of tumbling down.

Possibly this same condition holds true for other industries. Whichever industries are so affected, the educator should learn the facts and establish his program accordingly. Frank discussions between educators and industrialists can bring a solution to many of the problems with which both industry and the school are concerned. Industry will, when it recognizes the ability of the schools to offer adequate training, be more than willing to assist the schools with their problems.

Program for Schools

What can the school do? What help can the school get? What program should the school follow? These and many other questions may come to the minds of educators and school administrators. The following

Class room instruction in theoretical problems is as important to these apprentices—future foremen, supervisors, plant managers and superintendents—as practical shop experience.



line of procedure is suggested in the case of the castings industry:

First—Present working conditions in the foundry industry in a true light which means, for the most part, as well-paid work in better-than-average working conditions. Inspire students to find expression of the desire to achieve a worthwhile goal in the foundry. People still work for something besides money.

The foundry field is tremendous, but competition in it is relatively slight. Boy after boy dreams, however, of entering and succeeding in a field in which the competition is so great that only a few may succeed.

A.F.A. Helpful

Second—Seek the help of the technical and trade societies. The foundry field has several of these, foremost of which is the American Foundrymen's Association, worldwide technical society of the castings industry, with headquarters in Chicago. One of the Associations 33 chapters, located in the foundry centers of North America, may be in or near the school's community. Assistance can be expected from chapter educational committees or from the Association's Educational Division.

Questions to castings industry associations will receive prompt attention and are encouraged. These associations can assist the school to set up course outlines, can provide literature and other teaching aids, and can obtain the cooperation of local plants to participate in the school program.

The Foundry Equipment Manufacturers' Association provides an example of the type of assistance that is available. This association made a survey of all educational foundry facilities in schools of higher learning. The results of this survey are available for the asking. Returns from 126 schools offering active foundry courses were tabulated. The survey, "Foundries and Educational Institutions,"¹ gives the most desired equipment in order of preference, the various teaching aids used in foundry instruction, textbooks used and their popularity, and other information of importance to the instructor who is establishing a course.

¹"Foundries Aid Engineering Schools," AMERICAN FOUNDRYMAN, vol. IX, no. 2, February 1946, p. 42-45.

Third—Take advantage of the existing laboratory and educational facilities. Investigate the programs of foundry and pattern instruction of nearby schools. Sometimes these programs are supervised by outstanding instructors who have had years of experience in both the industry and in instruction. High-caliber men in the vocational field are always willing to give others the benefit of their experience. Make use of their knowledge.

Educators and school administrators can be more selective in hiring instructors. Although some vocational instructors are exceptionally good, many are only average and some are very poor. The persons responsible for the instruction offered in the school should consult employer and employee groups and secure their aid in selecting instructors. Foundrymen, some of them retired, would enjoy teaching, would inspire classes, and would provide a valuable industrial contact for the boys.

Fourth—Interest local industries in your school. Civic and commerce associations can provide the names of foundries in the school's area. Once the industry recognizes what the school is trying to do and knows the needs and desires of the school, a basis for beneficial cooperation can be established.

Ask the Foundrymen

Secure the assistance of those vitally interested in the craft in developing the school's program. Develop an instructional plan which will equip those receiving training to perform intelligently the duties and responsibilities of their employment. Such a plan should include the technical information which is directly related to the occupation for which training is offered.

The trade, vocational, and professional schools of twenty-five years ago did well in the basic development of the men who bear the responsibility in industry today. Unfortunately, these men are not being replaced. Industry, and the castings industry in particular, is badly in need of vocationally competent men. If training is effective today, many of the present students will become tomorrow's supervisors and managers in the foundries which are the keystone of American industrial civilization.

Arthur Klopff Joins Western Foundry Co.

ARTHUR S. KLOPF, senior engineer, Lester B. Knight & Associates, Chicago, has moved to Western Foundry Co., of the same city, where he will have charge of plants in Chicago, Holland, Mich., and Morris, Ill.

Mr. Klopff has been active in A.F.A. circles for many years, and is a past President, Chicago A.F.A. chapter. He is currently a Director of that group; Secretary, Committee on Analysis of Casting Defects, A.F.A. Gray Iron Division; member of the A.F.A. Refractories Committee, and representative of the Association on the ASTM Committee C-8 on Refractories. He also holds membership in the Society of Tool Engineers.

Graduate in mechanical engineering from Marquette University, Milwaukee, Mr. Klopff received the degree of Master of Science in metallurgical engineering from the University of Wisconsin, Madison, Wisconsin.

Engineering Training Transcript Available

TRANSCRIPTS of a discussion on engineering student training, in which sixteen representatives of the castings industry and of educational institutions participated, are now available. Issued as a 10,000-word mimeographed bulletin, the transcript covers the engineering schools session of the 1946 A.F.A. Annual Convention.

Under the joint chairmanship of G. J. Barker, chairman, Department of Mining & Metallurgy, University of Detroit, of that city, three speakers presented the point of view of college graduates in the foundry industry, and the attitude of management toward them.

The industry was represented by W. J. McNeill, Dayton Malleable Iron Co., Dayton, Ohio. A. S. Kramer, Calumet & Hecla Consolidated Copper Co., Detroit, and A. L. Stewart, Allis-Chalmers Co., Milwaukee, stated the case for recent college graduates.

Copies are available on request. Write to American Foundrymen's Association, 222 West Adams Street, Chicago 6.

CRUCIBLE FURNACE MELTING

COMBUSTION FACTORS

Arthur C. Schmid
Joseph Dixon Crucible Co.
Jersey City, N. J.

ALL METALS AND ALLOYS in the molten state have an affinity for certain gases, some metals more so than others. Absorption of gas may take place during melting, particularly if the metal comes into direct contact with the products of combustion in the melting furnace. It may also occur at any point where moisture comes into direct contact with the molten metal, such as moisture entrapped in the ingots or charging metal, in the air on a particularly humid day, or in a green sand mold.

When moisture comes into contact with molten metal a disassociation, or breakdown, of the moisture (H_2O) occurs, and the metal dissolving the hydrogen (H_2) thus liberated. The amount of pickup depends to a large extent on the type of metal and the temperatures involved. The affinity for gas increases as the temperature of the metal increases.

Another important source of gas is that originating from improperly vented cores. Organic core binders break down and liberate combustible gases, as evidenced by the fact that these gases ignite and burn at the core vents when the molten metal comes into contact with the cores. Quite frequently a casting made

in a mold containing numerous cores will show pinhole porosity, whereas one made from the same melt in a mold without cores shows no porosity.

Improper combustion during the melting, particularly as it relates to the melting of non-ferrous metals in gas- or oil-fired crucible furnaces of the stationary or tilting type, is unquestionably one of the most serious contributors to the "gassing" of metal. Therefore, too much emphasis cannot be placed on the importance of properly proportioning fuel (gas and oil) and air in order to obtain not only maximum furnace efficiency but quality castings as well.

Air:Fuel Ratio

In the typical crucible furnace for the melting of brass and bronze, the crucible sets on a pedestal, the flame from a tangential burner swirls around the crucible, and the products of combustion vent through the furnace cover hole. The metal and crucible are entirely surrounded by the flame and the gases, making it apparent that a proper air: fuel ratio setting of the burner is important in order that complete combustion take place in the furnace. If combustion is complete no reducing

gases will be present, particularly H_2 (hydrogen) and CO (carbon monoxide), to be dissolved by the metal. From the standpoint of crucible life and metal quality, the best burner ratio setting is one producing a neutral atmosphere inside the furnace.

Combustion processes are classified into three categories, the first of which is a condition where an insufficient quantity of air is used to burn the fuel, resulting in products of combustion containing no O_2 (oxygen), but containing the reducing gases H_2 and CO. This is referred to as incomplete combustion (reducing atmosphere), and is mainly responsible for the "gassing" of metals due, particularly, to H_2 pickup.

The second condition is where just enough air is used to burn the fuel completely, without excess, resulting in products of combustion containing practically no O_2 or H_2 . This represents perfect combustion, or a neutral atmosphere. The third condition is where an excess of air is used to burn the fuel, producing flue products that are oxidizing, containing O_2 with an absence of CO and H_2 . This is referred to as an oxidizing atmosphere, a condition not conducive to long crucible life due to oxidation of the crucible.

Manufactured gas (city gas) is quite widely used as a crucible furnace fuel, but varies considerably in analysis depending on location and method of manufacture. However, for any given locality the analysis is fairly constant. Curve "A" (Fig. 1) is typical of a manufactured gas and illustrates the variation in flue gas constituents as the quantity of air used for combustion is changed. For

► **Maintaining a proper fuel to air ratio and combustion rate in crucible melting is an important factor in eliminating conditions which may contribute to the "gassing" of metal and consequent scrap losses due to pinhole porosity.**

Presented at a Brass and Bronze Session of the Fiftieth Annual Meeting, American Foundrymen's Association, at Cleveland, May 8, 1946.

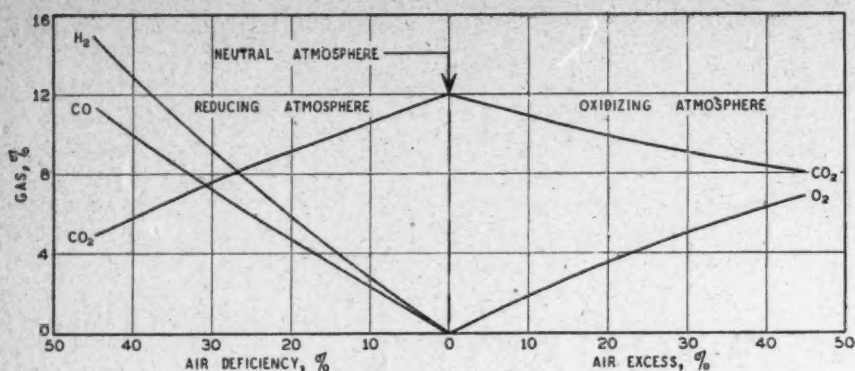


Fig. 1—(Curve A) Ratio of constituents in flue gas of manufactured gas-fired crucible furnace.

example, if 20 per cent less air is used than is required to complete combustion, an analysis of the products of combustion would show approximately 5 per cent CO, 6 per cent H₂ and 9 per cent CO₂ with no O₂, and is definitely reducing. This is not considered good melting practice from the standpoint of combustion efficiency or gas pickup by the metal. On the other hand, if 20 per cent excess air is used to burn the gas the products of combustion will show approximately 3½ per cent O₂ and 10 per cent CO₂, with no CO and H₂, definitely oxidizing.

Neutral Flame

This, likewise, is not considered good melting practice, resulting in excessive oxidation of the metal, fuel waste and oxidation of the crucible. Therefore, a neutral flame, the closest practical approach to perfect combustion, is the only alternative remaining in an effort to keep the O₂, CO and H₂ in the flue gas to a minimum. This is the midway point between a reducing flame and an oxidizing flame.

Curve "B" (Fig. 2) illustrates the ratio of the constituents in the flue gas of an oil-fired crucible furnace and is based on a No. 2 furnace oil with a C to H₂ ratio of 85 to 15. This follows exactly the same pattern as the manufactured gas curve but, inasmuch as two widely different fuel analyses are involved, the relationship between air supplied for combustion and flue products will be different in each case. What is common to both, however, is that a deficiency of air for combustion will result in incomplete combustion, producing a reducing atmosphere,

whereas an excess of air for combustion will result in complete combustion, or an oxidizing atmosphere.

Maintaining a correct fuel to air ratio in the combustion of oil or gas is important, but this should be coupled with a proper combustion rate. Rate of combustion is the amount of fuel burned in a given period of time. In starting a cold crucible melting furnace, the rate of combustion may be the same from the time the furnace is started until the crucible is pulled, although the efficiency of combustion may vary somewhat until the furnace reaches temperature.

Curves "A" and "B" (Figs. 1 and 2) are based on a furnace operation at near maximum temperature. Combustion rate is largely a matter of furnace size and design commensurate with what is established as a normal melting time for the size of crucible the furnace has been designed to accommodate. Burner size and capacity are also important factors in determining the combustion rate of a furnace of any particular size. These factors usually are determined and established by the furnace manufacturer.

At the present time combustion control normally is left in the hands of the crucible furnace melter, who

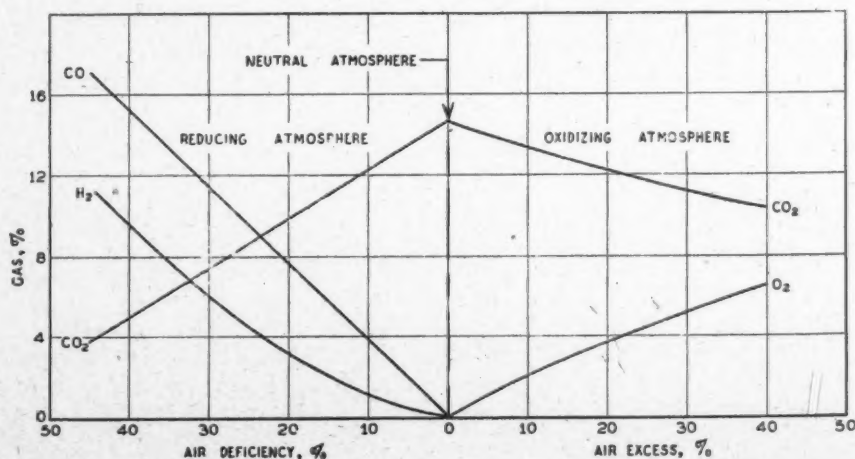
attempts to judge the proper fuel and air setting by visual analysis of the color of the flame exhausting through the cover hole of the furnace. At best this is a haphazard method, although some melters, with sufficient experience, become fairly proficient in their interpretation of flame color in terms of combustion efficiency. The author, having chemically analyzed the products of combustion from many crucible furnaces in order to check combustion, has found more often than not that flame color yields an erroneous answer.

The oxidation, or non-oxidation, of a piece of bright copper or zinc inserted through the cover hole of the crucible furnace may give a rough idea as to whether the furnace atmosphere is reducing or oxidizing, but it is doubtful if this method can be used to set the fuel and air ratio so as to obtain a critically neutral atmosphere.

Gas Analyzers

For the analysis of vent gases to determine the efficiency of combustion various types of gas analyzers are available, from the relatively simple type of portable instrument for obtaining periodic readings, to the permanently installed continuous automatic indicating and recording type of analyzer. The principle of operation may be electrical, mechanical, or chemical. For general foundry checking, probably the comparatively inexpensive, easy to operate, portable type of analyzer is most practical. A fast operating portable electrical analyzer has been devel-

Fig. 2—(Curve B) Ratio of constituents in flue gas of oil-fired crucible furnace.



oped which will quickly indicate whether the furnace atmosphere is reducing or oxidizing, but the readings from this type of instrument must be properly interpreted. It is questionable whether the continuous automatic recorder or indicator is a practical investment for the average non-ferrous foundry.

Exhaust Gas Analysis

High initial cost and difficulty of maintenance, particularly the gas sampling tube in the furnace, make the use of this equipment impractical. However, for laboratory and development work to determine combustion characteristics of a furnace this continuous automatic analysis equipment undoubtedly is of value.

Probably the most accurate method of analysis of the exhaust gases, and the most practical, is the determination of CO_2 , CO , and O_2 , by volume, by the chemical Orsat method. This involves the chemical absorption of each gas, samples being obtained through the furnace cover hole with a quartz or silica sampling tube. When making an analysis, it is important that an O_2 reading supplement the CO_2 reading, as a CO_2 reading alone may be misleading.

For example, referring to curve "B" (Fig. 2), a CO_2 reading of 12 per cent could be interpreted as 20 per cent excess air (oxidizing) or 10 per cent air deficiency (reducing), whereas if this is followed by an O_2 determination and the O_2 reading is 4 per cent, it definitely proves that the air is in excess. This indicates that either more fuel, or less air, is required in order to approach a neutral atmosphere, or a state of perfect combustion.

Burner Adjustment

While it is a simple matter to make a flue gas analysis and a burner adjustment, the stability of this adjustment is short-lived in the average foundry, particularly where both air and fuel are variable. A correct setting can be made during any particular melt, but when the metal is melted and ready for pouring the air and fuel usually are turned off.

When they are turned on again the new setting may be incorrect. Checking the furnace for correct combustion during each melt, or after each disturbance of the fuel and air valves, is impractical. A practical

solution would be the development of a burner, by the burner or furnace manufacturer, simple and foolproof in design, that would enable the melter to turn off both fuel and air without disturbing the ratio setting.

In addition, it should maintain the fuel and air ratio through the entire combustion range, from low flame

to high flame. In fact, considerable work has already been done along these lines and ratio controlled burners, for crucible melting furnaces, are beginning to appear on the market. This undoubtedly will help in maintaining uniform combustion, and aid in the elimination of gas absorption during the melting cycle.

NATIONS REVIVE International Foundry Committee

REPRESENTATIVES of seven countries, including the United States, voted unanimously at a gathering held in Paris, France, October 19, to revive the International Committee of Foundry Technical Associations, inactive since the beginning of war in Europe in 1939. At the same time the group unanimously elected Jean Lobstein, past president of the French Foundry Technical Association, the president of the International Committee for 1947. Mr. Lobstein was elected president of the committee in 1939 but the outbreak of hostilities prevented him serving at that time.

Thomas Makemson, secretary, Institute of British Foundrymen, London, was re-elected honorary secretary of the committee, which post he has held since the committee first was organized. Great Britain has been invited to nominate a member of IBF as vice-president, to serve as president in 1948.

The International Committee of Foundry Technical Associations was originally organized to select dates for the holding of international foundry congresses, to act as a clearing house for technical exchange papers between the various foundry technical groups throughout the world, and to consider the matter of setting up international standards in connection with foundry test methods and the like. A.F.A. has been a member of the group since inception, and was represented at the October meeting by Vincent Delpont, Penton Publishing Co., London, European representative on the A.F.A. Committee on International Relations. Other representatives present:

For Belgium, R. Deprez, president, and L. Foulon, treasurer, Association Technique de Belgique; for Czechoslovakia, Prof. M. F. Pisek,

president, Czech Foundry Association, and Dr. L. Jenicek; for France, A. Brizon, past president, and J. Laine, general secretary, Association Technique de Fonderie; for Great Britain, D. H. Wood, president, and V. C. Faulkner, past president, Institute of British Foundrymen, in addition to Mr. Makemson; for Holland, F. W. E. Spies, president, and Mr. Lipps, Dutch Foundry Association; for Poland, Prof. K. Gierdziewski, president, and Engr. J. Dickman, Polish Foundry Association. A. Le Thomas, director, Centre Technique des Industries, of France, also was present to discuss the Committee on Cast Iron Testing.

It was agreed that membership on the International Committee would be confined to countries having a qualified technical foundry association, and that membership might well be extended to nations which it is felt can contribute usefully to committee activities.

On behalf of A.F.A., Mr. Delpont extended an invitation for the committee to schedule a world foundry congress in the United States, and this invitation was accepted for 1952. The committee also accepted an invitation to meet at Liege, Belgium, in September 1947. It was agreed also to hold a European international in Czechoslovakia or Holland in 1948.

Scheduled discussions concerning the International Committee on Testing Cast Iron and the International Committee on Foundry Defects, were deferred pending receipt of further data from other countries. All members were invited to submit compiled material to the committee secretary. Another matter temporarily deferred for further study was the reissuance of an international dictionary of foundry terms.

HOTEL REQUESTS

For 1947 Convention Now In Order

HOTEL APPLICATION BLANKS, for requesting hotel accommodations at the 1947 annual convention of A.F.A., to be held in Detroit, April 28-May 1, were mailed to all members of the Association December 15. Since all hotel rooms at this 51st annual meeting will be assigned through an official housing bureau, A.F.A. members are urged to send in their requests promptly.

Adequate accommodations have been assured for housing members at Detroit, and both the Detroit Hotel Association and the Detroit Convention and Visitors Bureau have agreed to cooperate to the utmost. Detroit hotels have agreed to refer all requests for advance reservations to the Detroit Convention Bureau, whose housing experience is second to none for efficiency and dispatch.

While members now have hotel request forms, no forms will be sent others until after January 15. Assignment of rooms will not begin until February 15, and all member applications received by then will be considered as of that date. Since no exhibit will be held in 1947, applications of foundry operators naturally will receive first consideration.

Tentative Program

To assist those planning to attend in their selection of sessions, a tentative program of technical sessions will be mailed to A.F.A. members about January 1 and will be published in the January issue of AMERICAN FOUNDRYMAN. Major downtown Detroit hotels have been generous on the number of rooms set aside for the 1947 convention. In order to be of maximum assistance in filling room request, special attention is called to the following points in filling out reservation request forms:

(1) Show time (a. m. or p. m.) and date of arrival and departure at Detroit.

(2) Show name and company of all individuals for whom rooms are being reserved.

(3) Because of limited single rooms, please endeavor to double up wherever possible.

(4) To facilitate handling company reservations, all individuals ap-

plying from one company should make application together.

(5) Forward hotel reservation requests to the Housing Bureau in Detroit, not to the National office.

In accordance with A.F.A. policy in conducting annual meetings for the benefit of the industry as a whole, Detroit hotels have been asked to sign a housing agreement, from which the following paragraphs are quoted:

(1) Rates for sleeping rooms, meals and all other services will not be increased for the period of the convention.

(2) No sleeping rooms, suites, sample rooms or public space will be rented or permitted to be used for EXHIBIT purposes during the convention period.

(3) No public space will be rented or permitted to be used for purposes of ENTERTAINMENT or meetings during the convention period without the written approval of American Foundrymen's Association.

(4) Not more than SIX rooms will be assigned any one firm or individual without the consent of the Association.

(5) No directional or informational signs indicating the headquarters or events of firms or individuals will be permitted in lobbies, halls or corridors, or on hotel bulletin boards except as may be specifically authorized by the Association.

(6) The hotel management will cooperate in every way consistent with good hotel practice in providing for the convenience and comfort of members and guests of the American Foundrymen's Association.

PHILADELPHIA CONFERENCE

Program Attracts Large Attendance

A TWO DAY program which included one general session and six technical sessions made up the well rounded technical program which was presented at the Regional Foundry Conference held under the joint sponsorship of the A.F.A. Metropolitan, Philadelphia and Chesapeake chapters at Town Hall, Philadelphia, Friday and Saturday, November 1-2. A total registration of 500 foundrymen from the Eastern and Middlewestern states attended this conference.

General Committee

The three chairmen of the sponsoring A.F.A. chapters served as members of the general committee in charge of the conference. B. A. Miller, Baldwin Locomotive Works, Philadelphia, Chairman of the Philadelphia chapter, acted as committee chairman aided by H. L. Ullrich, Sacks-Barlow Foundries, Inc., Newark, N. J., Chairman of the Metropolitan chapter, and David Tamor, American Chain & Cable Co., York, Pa., Chairman of the Chesapeake chapter.

The program committee was headed by C. L. Lane, Florence Pipe Foundry & Machine Co., Florence,

N. J., with E. C. Troy, Dodge Steel Co., Philadelphia; National Director H. A. Deane, American Brake Shoe Co., New York; and Dr. Blake M. Loring, Naval Research Laboratory, Washington, D. C., as members of the program committee.

Thursday evening preceding the conference a top management meeting was held at the Bellevue-Stratford, attended by approximately 150 foundry executives from the A.F.A. Metropolitan, Philadelphia and Chesapeake chapter areas. Coffee talks were given by National Secretary-Treasurer W. W. Maloney and National Vice-President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va. Principal speaker was William D. Given, Jr., president, American Locomotive Co., New York.

Opposite page—Photographs of chairmen and speakers at the recent Philadelphia Regional Foundry Conference. Other photographs taken at the conference will be found on pages 78 and 81.



CHICAGO REGIONAL FOUNDRY CONFERENCE



KEYED TO the theme of "The Foundry Industry Faces the Future," the Chicago Regional Foundry Conference was held at the Continental Hotel, Chicago, on November 21-22, bringing together more than 500 midwest foundrymen for an outstanding program of 21 technical sessions.

Foundrymen of prominence in their field analyzed vital aspects of technology for gray iron, malleable iron, steel, non-ferrous metals, patternmaking and, in the two general sessions, good housekeeping and core blowing.

Conferences Resumed

This year's conference was the fourth of the series begun in 1938, and interrupted by wartime restrictions, and was sponsored jointly by the Chicago and Central Illinois A.F.A. chapters; Illinois Institute of Technology, Chicago; Northwestern University, Evanston, Ill., and University of Illinois, Urbana.

Conference Chairman was A. W. Gregg, Whiting Corp., Harvey, Ill., while Prof. R. G. Bigelow, Northwestern University; Prof. C. H. Casberg, University of Illinois, and F. F. Shoemaker, Illinois Institute of Technology, served as Associate Chairmen. A.F.A. National Director B. L. Simpson, National Engineering Co., Chicago, was Treasurer for the conference.

At the first of the general sessions, which opened the conference Thursday morning, Dean M. L. Enger, College of Engineering, Univer-

Pictured during the Chicago Regional Foundry Conference at the Continental Hotel, Chicago, November 21-22: Top right, Dean M. L. Enger, University of Illinois, Urbana, welcomes the delegates; at the speaker's right, James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., first technical speaker; at Dean Enger's left, L. H. Hahn, Sivy Steel Casting Co., Chicago, and Chairman, Chicago A.F.A. chapter. Lower left, the registration desks; lower right, general view of the hotel ballroom during the conference dinner of Thursday night.

sity of Illinois, Urbana, extended the official welcome to the delegates. Citing the role of foundries in the war effort and the technological developments through which production vital to the national effort was accelerated, Dean Enger hailed the conference as providing an opportunity for foundrymen to exchange information concerning such technology, now equally important to re-conversion.

Viewing the unprecedented demand for engineering personnel, the speaker explained that schools were extending every effort to meet the need for technically trained men in the foundry, as well as throughout all industry.

Foundry accomplishments were also highlighted in the first technical discussion of the conference by James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., who considered "Good Housekeeping and Foundry Maintenance."

Mr. Thomson lauded progressive management for the great strides made in cleaning up foundries and improving working conditions, and noted that making the foundry a more desirable place in which to

work is important in the current effort to interest qualified engineering graduates in foundry careers. A.F.A. and other foundry societies, the speaker stated, have played a leading role in bringing about improved conditions.

General discussion on this subject was among the most interested and prolonged of any at the conference sessions. L. H. Hahn, Sivy Steel Casting Co., Chicago, and Chairman, Chicago A.F.A. chapter, presided at the meeting and handled the question and answer period.

Dr. Heald Addresses Luncheon

At the Thursday luncheon, with F. W. Shipley, Caterpillar Tractor Co., Peoria, Ill., as chairman, Dr. H. T. Heald, president, Illinois Institute of Technology, again spotlighted the drive of the foundry industry for engineering graduates as he spoke on "Industry's Stake in Education."

Industries compete for the technically trained college men in view of the scarcity which, Dr. Heald said, amounts to practically a full generation; and he pointed out that the foundry, and other technical

process industries could benefit from establishment of cooperative courses, which combine study with work in the industry, as well as of scholarships and fellowships and in-plant training courses.

Urges Industry Publicity

The speaker also suggested wider dissemination of information concerning opportunities in the foundry. He declared that the present enrollment is of the highest caliber students, and that returning veterans are in school with the serious purpose of making good in a career of their choice—with a large percentage of them choosing engineering courses.

Gray iron sessions of Thursday afternoon heard R. A. Witschey, A. P. Green Firebrick Co., Chicago, and T. E. Barlow, Battelle Memorial Institute, Columbus, Ohio, on, respectively, "Cupola Refractories" and "Cupola Control and Operation."

Leading off the gray iron meetings, while H. W. Johnson, Wells Manufacturing Co., Des Plaines, Ill., sat as chairman, Mr. Witschey described the types of refractories in general use and their individual characteristics and properties, and went into detail on methods of their application in the cupola. He found

his audience intensely interested in various aspects of the subject, particularly daubing of joints, laying up blocks, contouring of the lining in the melting zone and the action of fluxes on the lining.

Mr. Barlow had as his chairman C. G. Mate, Greenlee Foundry Co., Chicago, and the speaker presented a comprehensive discussion of metallurgical control techniques for the cupola and presented operational recommendations.

Before a large audience at the Thursday afternoon session Leonard F. Tucker and Melville E. Kohler presented discussions on two subjects of interest to all patternmakers.

Mr. Tucker, City Pattern Works, South Bend, Ind., spoke first on the desire for cooperation between foundryman and patternmaker, and followed up with suggestions on how cooperation could be brought about. One suggestion advanced was that foundrymen should be sure they obtain the kind of pattern they desire. This developed the pattern construction problem—use of split patterns; mounted and unmounted patterns, etc. In discussing pattern construction, the speaker turned to the A.F.A. Apprentice Contest and used a number of apprentice patterns as illustrations of variation.

Martin Rintz, Continental Foundry & Machine Co., East Chicago, Ind., acted as chairman of Mr. Kohler's panel. The speaker, who is vice-president and general manager, Scientific Cast Products Co., Cleveland, gave an informative and well illustrated account of casting patterns in plaster; emphasizing that brass was the best material to use.

Dr. C. H. Lorig, Battelle Memorial Institute, discussed "Metallurgy of Malleable Iron" at the first technical session for the malleable program, with W. D. McMillan, International Harvester Co., Chicago, as chairman; while "Malleable Gating and Feeding Practice" was considered by J. H. Lansing, Malleable Founders' Society, Cleveland, who had B. C. Yearley, National Malleable & Steel Castings Co., of the same city, as chairman for the second malleable session.

Discusses Shop Job

Mr. Lansing displayed and discussed numerous castings illustrating methods of gating and feeding. Particular attention was drawn to necking down of runners so that they would break, rather than the casting, when gates were knocked off. In presenting an unusually interesting casting, of a clutch pedal, the speaker introduced C. C. Lawson, Wagner Malleable Iron Co., Decatur, Ill., who had cast the part and who led one of the most interesting discussions of the day, concerned with the unusual method of gating necessitated by its design.

Walter Edens, Ampco Metal, Inc., Milwaukee, discussed "Melting Problems of Special Bronzes" and W. A. Gluntz, Gluntz Brass Aluminum Foundry Co., Cleveland, spoke on "Budgeting Foundry Costs" for the two non-ferrous sessions on Thursday. W. B. George, R. Lavin & Sons, Inc., Chicago, was chairman on both occasions.

Steel Castings Imperfections

Steel foundrymen heard "Non-Metallic Inclusions in Steel Castings" described by F. W. Boulger, Battelle Memorial Institute, as F. B. Skeates, Link-Belt Co., Chicago, acted as chairman for the first half of their program the same afternoon, and concluded with a discussion of "Welding of Steel Castings—Stress Relieving and Testing," by J. K. McDowell, Rock Island Arsenal,

(Continued on Page 86)

Two groups of foundrymen at the Chicago Regional Foundry Conference, held November 21-22 at the Continental Hotel, Chicago, pause for the official conference photographer, Clyde Thomas, Whiting Corp., Harvey, Ill. Top (left to right)—Conference Chairman A. W. Gregg and past A.F.A. National President T. S. Hammond, both of Whiting Corp.; past A.F.A. Executive Vice-President C. E. Hoyt; A.F.A. Secretary Emeritus R. E. Kennedy; R. P. Hoelscher, dean of engineering, Chicago branch, University of Illinois; E. F. Galvin, Franklin Engineering Co., Chicago, and James Thomson, Continental Foundry & Machine Co., East Chicago, Ind.



FOUNDRY PERSONALITIES

Jas. H. Smith has been appointed general manager of the expanded Central Foundry Div., General Motors Corp., with headquarters in Saginaw, Mich. **S. W. Healy**, in charge of the present division, will be assistant to Mr. Smith. Included in the reorganized group will be the Saginaw Malleable Iron, Danville and Lockport divisions and a proposed new plant at Defiance, Ohio. **B. A. Dollens**, formerly general manager of the Saginaw Malleable Iron organization, transfers to La Grange, Ill., as assistant general manager, Electro-Motive Div. Mr. Smith is a National Director of A.F.A.

J. S. Hutchins, president, Ramapo Ajax Div.; **W. T. Kelley, Jr.**, president, Engineered Castings and Kellogg divisions; **T. W. Pettus**, president, National Bearing Div., and **J. B. Terbell**, executive vice-president, American Manganese Steel Div., have been elected vice-presidents of American Brake Shoe Co., New York. **Homer Parsons**, since 1945 a sales representative for the export department of that firm, has been named assistant director of exports.



J. S. Hutchins



W. T. Kelly, Jr.

I. R. Wagner, president, Electric Steel Castings Co., Indianapolis, was elected President, National Founders Association, Chicago, at the 49th annual convention of the Association, in New York. He is a past A.F.A. National Director.

J. P. Gill, vice-president, Vanadium-Alloys Steel Co., Latrobe, Pa., was presented recently with the

honorary degree of Doctor of Engineering by the University of Missouri, Columbia, on the occasion of the 75th anniversary of the founding of the Missouri School of Mines and Metallurgy. Mr. Gill, who is widely known through his technical writings and lectures on high speed carbon and alloy tool steels, has served as National President, American Society for Metals, and presented the annual Campbell Memorial Lecture.



T. W. Pettus



J. B. Terbell

D. A. Currie, president, treasurer and general manager; **F. F. Clarke**, first vice-president, and **D. W. McDonald**, second vice-president, were re-elected at the annual meeting of the stockholders and directors of Erie Foundry Co., Erie, Pa., and **J. F. Currie**, actively engaged in the shop and offices of the company since his release from the Navy a year ago, was elected secretary.

H. A. Campbell, for the past seven years director of research, Solar Aircraft Co., San Diego, Calif., resigned that position recently. He is succeeded by **Dr. M. A. Williamson**, recently discharged from the Navy, who will have as assistants: **Dr. J. A. Southard**, in charge of process control, and **R. V. Hilkert**, as chief metallurgist.

A. B. Andrews, during the war in Washington, D. C., on special assignment with the Ordnance Department, joins O.K. Tool Co. Div., Aerodynamic Research Corp., Shelton, Conn., as sales manager, according to announcement by **A. L.**

Marshal, general manager of the division. For many years, Mr. Andrews was in charge of sales for E. A. Kinsey Co., Cincinnati.

Robert Doelman leaves Harry W. Dietert Co., Detroit, to join Miller & Co., Chicago.

R. S. Clingan, general manager of sales, Copperweld Steel Co., Warren, Ohio, announces the appointments of **J. L. Stone**, metallurgical sales engineer, as New York district sales manager, and **Harry Gafke**, contact metallurgist, as Chicago district sales manager.

A. G. Anderson, **W. M. Hall**, **Claude Watson**, **Robert Campbell** and **William Antisdale, Jr.**, are incorporators of the Centrifugal Foundry Co., Muskegon Heights, Mich., in a recent move which involved changing the firm title from Centrifugal Castings Co.

John Glasrud recently joined Minneapolis Moline Power Implement Co., Minneapolis, as assistant metallurgist.

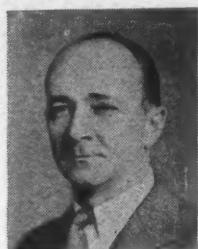
H. G. Uphouse, Philadelphia, has become eastern sales representative of industrial and miscellaneous steel castings for Continental Foundry & Machine Co., East Chicago, Ind., in a recent appointment.

J. V. Schrock, since 1929 assistant to the general superintendent, Jones & Laughlin Steel Corp., Pittsburgh, has retired after 23 years service with the firm.

Ralph Wedgwood moves from Erie, Pa., to St. Louis, Mo., as district sales manager, Pickands-Mather Co. He is succeeded in the same capacity for the firm at Erie by **R. J. Harding**. Both are members of Northwestern Pennsylvania A.F.A. chapter; Mr. Wedgwood has headed the chapter meeting

AMERICAN FOUNDRYMAN

reservations committee, a responsibility Mr. Harding also takes over.



Joseph Sully



Bruce Bevelheimer

Joseph Sully, president and general manager, Sully Brass Foundry, Ltd., Toronto, Ont., assumes the position of vice-president and the charge of all manufacturing operations of Neptune Meters, Ltd., following amalgamation of the two firms, the former of which will be operated as the Sully Foundry Division. Mr. Sully is an A.F.A. National Director.

Bruce Bevelheimer, associated with the steel industry since 1924 and recently with Algoma Steel Corp., Sault St. Marie, Ont., joins Furnace Engineers, Inc., Pittsburgh, as assistant to the vice-president.

W. A. Zeis, partner in the Midwest Foundry Supply Co., Webster Groves, Mo., has sold his interest in that firm, which has been dissolved following the death of **T. C. Hamlin**, co-partner. Mr. Zeis continues in business under the firm name of **Walter A. Zeis**, in the same city.

Gordon Atherton, Premier Furnace Co., Dowagiac, Mich., and a member of Michiana A.F.A. chapter, moves to South Park Foundry, Minneapolis, as foundry superintendent. He will transfer membership to Twin City A.F.A. chapter.

C. E. Price, for 11 years associated with Peninsular Grinding Wheel Co., Detroit, and recently vice-president in charge of sales, became president of the firm in a recent election.

R. C. Roll, purchasing agent, Burnham Boiler Corp., Zanesville, Ohio, advances to the position of

assistant to plant manager, and is succeeded as purchasing agent by **H. F. Smith**, in promotions recently announced by the firm.

L. S. Montcrief, for 25 years associated as patternmaker and foreman with Stockham Pipe Fittings Co., Birmingham, Ala., is president of Southern Precision Pattern Works, of the same city, a new firm engaged in the manufacture of wood and metal patterns. Also principals in the new organization are **J. L. Corley**, as vice-president, and **J. P. Bryant**, as secretary and treasurer, both journeyman patternmakers of long experience.



L. S. Montcrief



W. H. Everitt

W. H. Everitt, who has spent many years in the hydraulics field, in designing, testing, research, development and as a sales engineer, recently contracted to represent Hydropress, Inc., New York, as sales representative for Washington, Oregon and British Columbia. He will make his headquarters in the firm's Seattle office.

F. O. Gorman, who has been associated with Donovan Manufacturing Co., Winona, Minn., joins Hirscheimer Foundry, La Crosse, Wis.

Obituaries

Thomas Morrison, since 1917 a director, International Nickel Co. of Canada, Ltd., died at his home at Spring Lake, N. J., on October 26.

Mr. Morrison, a native of Scotland, served his apprenticeship as a machinist and engineer in that country, and came to the United States in 1886. He was associated with Carnegie Steel Corp. and was appointed superintendent of that firm's Duquesne Works in 1891 and general superintendent of its Edgar Thomson Works in 1895, resigning

in 1901. He was co-inventor, with **Julian Kennedy**, of a process for slow cooling of rails, known as the Kennedy-Morrison Process.

With International Nickel Co., Mr. Morrison was the second oldest board member in point of service. He also served as a director of United States Steel Corp. from 1902 to 1911, and from 1914 to 1937.

Michael A. Bell, president, M. A. Bell Co., St. Louis, died suddenly at his home in Richmond Heights on October 22.

A charter member of St. Louis District A.F.A. chapter, Mr. Bell had long been active in the activities of the Association, and was a familiar figure at national conventions. He was a native of St. Louis, and founded the company which bears his name in 1928, after having been associated with **E. J. Woodison Co.**, Detroit.

David W. Dieter, until his retirement five years ago, owner, Dieter Foundry, Cherryville, Pa., died recently at his home in Bowmanstown, after a year's illness.

Son of the original owner of the Dieter Foundry, the late **George B. Dieter**, he was a native of Cherryville, and succeeded to the ownership of the firm in 1904. Earlier, **David Dieter** had served his foundry apprenticeship with the Mosser foundry, Allentown, Pa. He developed his firm from a one-man plant to one of 90 employees.

Henry J. Noble, Sr., since 1927 works manager, American Cast Iron Pipe Co., Birmingham, Ala., and associated with that firm for more than 35 years, died November 20, after a long illness.

Mr. Noble was a native of Dallas, Texas, and member of a family long associated with the iron industry at Anniston, Ala. He was a graduate of Alabama Presbyterian College, and joined American Cast Iron Pipe Co. in 1910.

He was widely known among foundrymen of the Birmingham area, and was one of the most active members of the Birmingham District A.F.A. chapter. Mr. Noble also held membership in the Birmingham Country Club and the Newcomen Society of America.

★ NEW A. F. A. MEMBERS ★

(Covering the period from October 15 to November 15)

● Presented on these pages are the names of 238 new A.F.A. members; contributed by numerous members of A.F.A. chapter membership committees. A total of 30 chapters are represented below as they added from one to 36 names to their chapter rosters. The Eastern Canada and Newfoundland chapter with 36 names won highest honors for the month; Northeastern Ohio with 25 was second and Saginaw Valley finished in a strong show position with 20.

Conversion—Personal to Company.

*Brisk Foundry & Machine Co., Imlay City, Mich. (Carl Schneider, Supt.)

BIRMINGHAM DISTRICT CHAPTER

*Augusta Iron Works, Augusta, Ga. (F. W. Taylor, Gen. Mgr.)
L. E. Foley, Fdry. Fore., McWane Cast Iron Pipe Co., Birmingham.
Charles B. Long, Melter, American Cast Iron Pipe Co., Birmingham.
J. E. Reynolds, Jr., Continental Gin Co., Birmingham.
W. C. Trombly, Salesman, Moore-Handley Hardware Co., Birmingham.

CANTON DISTRICT CHAPTER

Robert W. Bair, United Engineering & Foundry Co., Canton, Ohio.
John Erisey, United Engineering & Foundry Co., Canton, Ohio.
G. L. Hawkins, Schrader Foundry Inc., Dover, Ohio.
James Meehan, Canton Pattern & Mfg. Co., Canton, Ohio.
John Robert Pfouts, United Engineering & Foundry Co., Canton, Ohio.
*Schrader Foundry Inc., Dover, Ohio. (Bernard Schrader, Pres.)
Adam J. Texter, Sales Engr., Exothermic Alloys Sales & Service, Inc., Massillon, Ohio.
John K. Watson, United Engineering & Foundry Co., Canton, Ohio.

CENTRAL ILLINOIS CHAPTER

Maurice G. Elwood, Foreman, Caterpillar Tractor Co., E. Peoria.
Louis G. Mauer, Sales Engr., Frederic B. Stevens, Inc., Detroit, Mich.
Robert L. Selburg, Fdry. & Pattn. Shop Training Inst., Caterpillar Tractor Co., Peoria.
William V. Trdin, Patternmaker Apprentice, Caterpillar Tractor Co., Peoria.

CENTRAL INDIANA CHAPTER

Albert Bradley, Fdry. Fore., C & G Foundry & Pattern Works, Indianapolis.
Don Carpenter, Prod. Engr., B & B Foundry, Indianapolis.
Ollie Gray, Core Room Fore., C & G Foundry & Pattern Works, Indianapolis.
Harry P. Hardy, Secretary, Hougland & Hardy, Inc., Evansville.
Rudolph Holmes, Fdry. Fore., C & G Foundry & Pattern Works, Indianapolis.
Ernest Mattingly, Pattern Fore., C & G Foundry & Pattern Works, Indianapolis.
Keith L. Pemberton, Group Leader, International Harvester Co., Indianapolis.
A. C. Pfau, American Air Filter Co., Inc., Indianapolis.
John Poole, Fdry. Fore., C & G Foundry & Pattern Works, Indianapolis.
Harvey A. Tilson, Asst. Plant Safety Director, International Harvester Co., Indianapolis.
Wilson E. Voyles, Co-op Student, Delco-Remy Div., General Motors Corp., Anderson.
Ira L. Wells, Salesman, Swan Finch Oil Corp., Chicago.

CENTRAL NEW YORK CHAPTER

Joseph S. Buccolo, Fdry. Mgr., Utica General Jobbing Foundry, Inc., Utica.
*The Engelberg Huller Co., Inc., Syracuse. (Leo Schaller, Factory Mgr.)

CENTRAL OHIO CHAPTER

*Furnace Foundry Co., Jackson. (D. A. Evans, Mgr.)
A. Floyd Wise, Columbus Ohio Pattern & Mfg. Co., Columbus.

CHESAPEAKE CHAPTER

J. Raymond Haupt, Fore., Balmar Corp., Baltimore, Md.

*Company Members.

Charles E. Marsh, Partner, Elevator Engineering Co., Baltimore, Md.
James H. Wamer, Gen. Fore., Balmar Corp., Baltimore, Md.

CHICAGO CHAPTER

E. G. Counselman, Sales Engr., Illinois Clay Products Co., Chicago.
A. S. Golding, Owner, Triumph Foundry & Machine Shop, Joliet, Ill.
John C. Guibert, Sales, Ross-Tacony Crucible Co., Philadelphia.
(Mrs.) Helen D. Hoover, Chem. Met., Ahlberg Bearing Co., Chicago.
G. S. Kennelley, Sales Engr., General Refractories Co., Chicago.
E. C. Ludwig, Sales, Ross-Tacony Crucible Co., Philadelphia.
William J. Meid, Pyro Clay Products Co., Oak Hill, Ohio.
Kurt A. Miericke, Met. Dev. Eng., U. S. Gypsum Corp., Chicago.
Eugene Moore, Fore., Hammond Brass Works, Hammond, Ind.
I. E. Poehler, Sales, Ross-Tacony Crucible Co., Philadelphia.
F. M. Ruggles, Sales Engr., The M. W. Kellogg Co., Chicago.
C. H. Vennetti, Whiting Corp., Harvey, Ill.
Joseph F. Vokac, Gray Iron Fdry. Millwright, International Harvester Co., Chicago.
Herbert A. White, Mgr., Smeeth-Harwood Co., Chicago.
S. M. Zimmerman, Secy., Hansell-Elcock Co., Chicago.

CINCINNATI DISTRICT CHAPTER

Lawence Placke, Fdry. Supt., Advance Foundry Co., Dayton, Ohio.

DETROIT CHAPTER

Alex Berecz, Fore., Michigan Malleable Iron Co., Detroit.
Kenneth E. Davis, Fdry. Met., Cadillac Motor Car Co., Detroit.
Popatal P. Doshi, Chrysler Corp., Dodge Div., Detroit.
John S. McNally, Sales Engr., Moen, Michigan Sales & Engine Co., Detroit.
*Northville Foundry & Mfg. Co., Northville, Mich. (James D. Friel, Pres.)

EASTERN CANADA & NEWFOUNDLAND CHAPTER

G. Bolduc, Molder, Canadian Car & Foundry Co. Ltd., Brantford, Ont.
F. Bouthillette, Fore., Robert Mitchell Co. Ltd., St. Laurent, Que.
Maurice Breton, Sand Control, Sorel Industries, Ltd., Sorel, Que.
Robert Buchan, Crane Ltd., Montreal, Que.
Benjamin Carry, Professor, Arts & Crafts School, Provincial Government, Sherbrooke, Que.
Roger Champagne, Sand Testing, Sorel Industries, Ltd., Sorel, Que.
Jean Claes, Core Room Fore., Robert Mitchell Co. Ltd., St. Laurent, Que.
Yvon Courchesne, B.A.Sc. (Metallurgy), Sorel Industries Ltd., Sorel, Que.
Robert Crawford, Foreman, Montreal Bronze Ltd., Montreal, Que.
J. A. Dancose, Supv., Terrebonne Foundry Inc., Terrebonne, Que.
J. Henri Dancose, Pres., Terrebonne Foundry Inc., Terrebonne, Que.
P. A. Dauncey, Owner, P. A. Dauncey Foundry, Sherbrooke, Que.
J. deBellefeuille, Robert Mitchell Co. Ltd., St. Laurent, Que.
Walter Dilks, Patternmaker, Canadian Car & Foundry Co. Ltd., Brantford, Ont.
Dion Freres Inc., Ste. Therese, Que.
W. R. Duplex, Asst. to Pres., Canadian Bronze Co. Ltd., Montreal, Que.
Clarence R. Dutton, Fdry. Fore., Crane Ltd., Montreal, Que.
Ralph B. Eastham, Asst. Fore., Montreal Bronze Ltd., Montreal, Que.
P. J. Frost, Sales & Service, Engr., Robins Conveyors, Inc., Montreal, Que.
R. Galarneau, Fore., Robert Mitchell Co. Ltd., St. Laurent, Que.
George Jamieson, Canadian Car & Foundry Co. Ltd., Montreal, Que.
R. Labonte, Molder, Canadian Car & Foundry Co. Ltd., Montreal, Que.
Robert Lacoste, Molder, Canadian Car & Foundry Co. Ltd., Montreal, Que.
Arthur Lussier, Molder, Jenkins Bros., Montreal, Que.
John Macejeunas, Molder, Canadian Car & Foundry Co. Ltd., Montreal, Que.
Alex J. Magee, Coremaker, Crane Ltd., Montreal, Que.
Gerard Millette, Core Room Fore., Sorel Industries Ltd., Sorel, Que.
Alfred Morissette, Molder, Robert Mitchell Co. Ltd., St. Laurent, Que.
Dorius Morissette, Molder, Northern Foundry, Ltd., Montreal, Que.
R. Primeau, Foreman, Robert Mitchell Co. Ltd., St. Laurent, Que.
Wesley Pugh, Asst. Fore., Montreal Bronze Ltd., Montreal, Que.
William Rousseau, Molder, Northern Foundry, Ltd., Montreal, Que.
Andre Turcot, Molder, Canadian Car & Foundry Co. Ltd., Montreal, Que.

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Gerard Tremblay, Molding Machine Fore., Sorel Industries Ltd., Sorel, Que.

H. E. Walford, Sec.-Treas., H. Walford Ltd., Montreal, Que.

Percy Weissman, Asst. to Pres., Liberty Smelting Works, Montreal, Que.

METROPOLITAN CHAPTER

J. Forrest Campbell, V.-P. & Treas., Campbell Foundry Co., Harrison, N. J.

*Campbell Foundry Co., Harrison, N. J. (J. Robert Campbell, Pres.)

John L. Griffith, Dist. Mgr., American Smelting & Refining Co., Boston.

Robert V. Hunter, Werner G. Smith Co., New York.

William M. Jung, Sperry Gyroscope Co., Inc., Great Neck, L. I., N. Y.

*Newark Brass Foundry, Kearny, N. J. (Frank Hierwarter, Partner)

MICHIANA CHAPTER

*Covel Mfg. Co., Benton Harbor, Mich. (Alvin Filstrup, Jr., Secy.-Treas.)

Donald J. Fields, Fore., Studebaker Corp., South Bend, Ind.

George W. Gaw, Gen. Mgr., Midwestern Foundries, Inc., Garrett, Ind.

B. C. Hagquist, Pres., Woodward Pattern Works, Inc., South Bend, Ind.

Wm. F. McMacken, Fore., Studebaker Corp., South Bend, Ind.

Luther Minix, Fore., Josam Products Foundry Corp., Michigan City, Ind.

Harry R. Shick, Jr., Salesman, Hickman, Williams & Co., Chicago.

Darford Sisson, Gen. Mgr., Sisson's Aluminumware Co., St. Joseph, Mich.

NORTHEASTERN OHIO CHAPTER

William Aston, Fore., Superior Foundry, Inc., Cleveland.

R. F. Baley, The Ferro Machine & Foundry Co., Cleveland.

Stanley Cmunt, Fore., Superior Foundry, Inc., Cleveland.

Stephen Feiss, Met., Superior Foundry, Inc., Cleveland.

Carl Fisher, Fore., Superior Foundry, Inc., Cleveland.

Alexander Fowler, Supt. Front Shop, Superior Foundry, Inc., Cleveland.

Charles Geesey, Met., Superior Foundry, Inc., Cleveland.

Norris Hange, Fore., Superior Foundry, Inc., Cleveland.

A. H. Hinton, Mgr. Cleveland Sand Fdry., Aluminum Co. of America, Cleveland.

Edward Hrdlicka, Supt. Superior Foundry, Inc., Cleveland.

Harry G. Huff, Sales Engr., Fulton Foundry & Machine Co., Inc., Cleveland.

Norbert Jirousek, Fore., Superior Foundry, Inc., Cleveland.

John T. Miller, Lab. Tech., The Fanner Mfg. Co., Cleveland.

T. M. Moon, Die Designer, Lake City Malleable Co., Ashtabula, Ohio.

Fred P. Murschel, Asst. Works Mgr., Farrell Cheek Steel Co., Sandusky, Ohio.

Charles Orihel, Fore., Superior Foundry, Inc., Cleveland.

Walter L. Seelbach, Pres. & Gen. Mgr., Superior Foundry, Inc., Cleveland.

James A. Steele, Salesman, Ramer Industrial Sales Co., Cleveland.

Bernard Stevens, Fore., Superior Foundry, Inc., Cleveland.

Clayton Stevens, Fore., Superior Foundry, Inc., Cleveland.

William Stevens, Works Mgr., Superior Foundry, Inc., Cleveland.

Clem Swencki, Fore., Superior Foundry, Inc., Cleveland.

Wilbur A. Thomas, Fdry. Supt., The Bowler Foundry Co., Cleveland.

James R. Thompson, Molder, Fulton Foundry & Machine Co., Inc., Cleveland.

Harold Wheeler, Personnel Dir., Superior Foundry, Inc., Cleveland.

NORTHERN CALIFORNIA CHAPTER

A. B. Castagnola, Pres., General Foundry Service Corp., Oakland.

Ralph E. Peters, Jr., Sales Engr., Electro Metallurgical Sales Corp., San Francisco.

E. J. Ritelli, Secy.-Treas., General Foundry Service Corp., Oakland.

John R. Russo, Vice-Pres., General Foundry Service Corp., Oakland.

Roy R. Thut, Gen. Mgr., Thut's Foundry, Oakland.

NO. ILLINOIS-SO. WISCONSIN CHAPTER

*Mattison Machine Works, Rockford, Ill. (R. W. Mattison, V.P.)

Charles Nethery, Fore., Mattison Machine Works, Rockford, Ill.

Vernie Peterson, Fore., Mattison Machine Works, Rockford, Ill.

NORTHWESTERN PENNSYLVANIA CHAPTER

Phil Sheridan, Griswold Mfg. Co., Erie.

ONTARIO CHAPTER

P. R. Ferguson, Asst. Mgr., J. R. Ferguson Co., Dundas.

OREGON CHAPTER

V. Clifford Burley, Abrasive Engr., The Carborundum Co., Niagara Falls, N. Y.

Richard N. Cocklin, Ind'l Engr., Western Industrial Supply Co., Portland.

Preston K. Doughty, Appr. Ptnmkr., Dependable Pattern Works, Portland.

Milan Sepich, Fdry. Fore., Western Foundry Co., Portland.

Henry C. Weiss, Fdry. Supt., Vaughan Motor Works, Portland.

PHILADELPHIA CHAPTER

Robert M. Brick, Prof. of Met., University of Pennsylvania, Philadelphia.

*Company Members.

DECEMBER, 1946

*Downingtown Mfg. Co., Downingtown, Pa. (Andrew E. Walker, Gen. Supt.)

Emanuel Kruse, Owner, Kruse Pattern Works, Camden, N. J.

James R. McQuaide, Salesman, John P. Clark Co., Philadelphia.

Charles C. Miller, Jr., Salesman, Hanna Furnace Corp., Philadelphia.

Carl Ohnmeiss, Chemist, Dodge Steel Co., Philadelphia.

Nelson H. Oliver, Downingtown Mfg. Co., Downingtown, Pa.

Harry E. Rastatter, Sales Engr., Smith-Sattler Co., Philadelphia.

Joseph Thorn, Fore., Fletcher Works, Inc., Philadelphia.

QUAD-CITY CHAPTER

W. D. Chadwick, Serv. Engr., Manley Sand Co., Rockton, Ill.

D. DeJohn, John Deere Dubuque Tractor Co., Dubuque, Iowa.

C. V. Hansen, John Deere Dubuque Tractor Co., Dubuque, Iowa.

B. P. O'Hare, John Deere Dubuque Tractor Co., Dubuque, Iowa.

ROCHESTER CHAPTER

Raymond Till, Draftsman, The Symington-Gould Corp., Rochester, N. Y.

SAGINAW VALLEY CHAPTER

Frank J. Adamowski, Fore., Dow Chemical Co., Andre Bay, Mich.

Wm. R. Bond, Mold. Fore., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.

Dea L. Buckland, Shipping Mgr., Brisk Foundry & Machine Co., Inc., Imlay City, Mich.

Frank Burder, Sales Engr., Wolverine Foundry Supply Co., Detroit.

Richard E. Carr, Research Mgr., Dow Chemical Co., Midland, Mich.

Guy J. Edwards, Chevrolet Grey Iron Foundry, General Motors Corp., Saginaw, Mich.

Anthony Forgash, Sec.-Treas., Jetro Corp., Bay City, Mich.

George P. Harris, Pres., Jetro Corp., Bay City, Mich.

Norman J. Henke, Processing Supt., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.

*Jetro Corp., Bay City, Mich. (E. L. Rich, Plant Mgr.)

Adam J. Meyer, Fore., Chevrolet Grey Iron Fdry., General Motors Corp., Saginaw, Mich.

Harvey Nitz, Fore., Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.

John O'Brien, Sales Mgr., Jetro Corp., Bay City, Mich.

Vernon J. Sadler, Jr., Director of Stds., General Foundry & Mfg. Co., Flint, Mich.

*Sand & Stone, Inc., Bay City, Mich. (B. T. Scharbach, V.P.)

Charles B. Schofield, Fore., Chevrolet Grey Iron Foundry, General Motors Corp., Saginaw, Mich.

Raymond Stack, Supt., Saginaw Bearing Co., Saginaw, Mich.

Donald L. Stinson, Fore., Chevrolet Grey Iron Foundry, General Motors Corp., Saginaw, Mich.

Harold Timmons, Plant Supt., Jetro Corp., Bay City, Mich.

Joseph C. Woodrow, Fore., Chevrolet Grey Iron Foundry, General Motors Corp., Saginaw, Mich.

ST. LOUIS DISTRICT CHAPTER

J. H. Wedde, Owner, Ace Pattern Co., St. Louis, Mo.

SOUTHERN CALIFORNIA CHAPTER

Raymond L. Farlin, Salesman, Chamberlain Co., Los Angeles.

Dave H. Johnstone, Partner, Firestone Foundry, South Gate.

Otto H. Rosentreter, Field Engr., National Engineering Co., Chicago.

E. G. Stoeple, Repr., Chamberlain Co., Los Angeles.

*Triple A Metalcraft Corp., Los Angeles (C. J. Amick, Pres.)

TOLEDO CHAPTER

Fred W. Ronfeldt, Ronfeldt Pattern Works, Toledo, Ohio.

TWIN-CITY CHAPTER

Robert E. Allen, Sls. Repr., Harbison-Walker Refractories Co., Pittsburgh, Pa.

Leo M. Malis, Fdry. Supt., Crown Iron Works Co., Minneapolis.

Roy C. Nelsen, Salesman, Sterling Wheelbarrow Co., Milwaukee.

Carl L. Newstrom, Storekeeper, Crown Iron Works Co., Minneapolis.

Roland J. Oliver, Progress Pattern & Foundry Co., St. Paul.

Donald C. Russ, Progress Pattern & Foundry Co., St. Paul.

WESTERN MICHIGAN CHAPTER

Edward Coleson, Sand Research, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.

WESTERN NEW YORK CHAPTER

Robert L. Doelman, Sales, National Engineering Co., Chicago.

H. S. Nathan, Sales Engr., Atlas Plastics, Inc., Buffalo.

Stanley Nowakowski, Cleaning Fore., Acme Steel & Malleable Iron Works, Buffalo.

Alexander Rankin, Lake Erie Eng. Corp., Buffalo.

WISCONSIN CHAPTER

Edward C. Berg, Fdry. Student, International Harvester Co., Milwaukee.

J. Melvin Crain, Co-Partner, Midwest Pattern Co., Milwaukee.

Bernard Fridl, Works Mgr., The Vilter Mfg. Co., Milwaukee.

Benjamin O. Jones, Standard Brass Works, Milwaukee.

John J. Schmidt, Sec. & Treas., Menomonee Falls Brass & Aluminum Foundry, Menomonee Falls, Wis.

Lee Woehlke, Sales Repr., J. S. McCormick Co., Pittsburgh, Pa.

OUTSIDE OF CHAPTER

A. G. Bowman, Atlas Foundry & Machine Co., Tacoma, Wash.
Paul Bromley, Pres., Eagle Pattern & Mfg. Co., Seattle, Wash.
H. L. Buchanan, Pattern Checker, Cooper-Bessemer Corp., Grove City, Pa.
J. F. Dolansky, Supt., Griffin Wheel Co., So. Tacoma, Wash.
Hermann F. Eilers, Jr., Asst. Fdry. Mgr., Corning Glass Works, Charleroi, Pa.

*Enardo Foundry & Mfg. Co., Inc., Tulsa, Okla.
Stanley H. Marshall, Met., Atlas Foundry & Machine Co., Tacoma, Wash.
Werton D. Moore, Owner, W. D. Moore Co., Tulsa, Okla.
*National Bronze Co., Springfield, Mass. (F. W. Enzenbacher, Owner)
P. W. Thompson, Salesman, Balfour, Guthrie & Co., Ltd., Seattle, Wash.
Denny Vena, Mgr., American Foundry Co., Seattle, Wash.
Ray Witham, Salesman, Balfour, Guthrie & Co., Ltd., Seattle, Wash.

Argentina

Pedro F. Merlini, Ingeniero, Pedro Merlini & Sons S.R.L., Buenos Aires.

Australia

Alfred P. Ffarrington, Deputy Principal, Perth Technical College, Western Australia.
Andrew N. Hamilton, Works Director, Stewarts & Lloyds Pty, Ltd., Newcastle, N. S. W.
A. W. Ulmer, Standard Chemical Co., Melbourne, Victoria.

Brazil

Ernesto G. Diederichson, Elevados Atlas, S. A., Sao Paulo.
Dr. Heraldo de Souza Mattos, Instituto Nacional de Tecnologia, Rio de Janeiro.

*Company Members.

Czechoslovakia

Skodovy Zavody (Skoda Works), Prague.

England

George Ewart France, Chairman & Mng. Director, August's Ltd. Halifax, Yorkshire.
J. F. B. Jackson, Tech. Supt., David Brown & Sons Ltd., Penistone Works, Penistone, Nr. Sheffield.
Robert T. Parker, Dr., Aluminum Laboratories Ltd., Oxfordshire.
F. E. Tibbenham, Suffolk Iron Foundry (1920) Ltd., Stowmarket, Suffolk.
Frank Webster, Director, August's Ltd. Halifax, Yorkshire.

Finland

Ernst Alander, Engr., Hogfors Bruk, Karkkila.

France

Paul Desombre, Pres., Compagne Electro Mecanique, Paris.
Jean Horman, Director, Acieries de Blanc-Misseron, Quievrechain, Nord.
Ste Aue Inter-Technique, Paris Ville.

Greece

A. Mazaraki, Mng. Director, Thermis Mfg. Co. Ltd., Athens.

Holland

Fieffer Clausing, Dr., N. V. Philips Gloeilampenfabrieken, Emmasingel, Eindhoven.
Yser-en Metaalgieterij, De Globe, Tegelen.

Netherlands

W. H. Boom, Mng. Director, G. Dikkers & Co., Hengelo, O.

South Africa

Prof. L. Taverner, Govt. Met. Lab., University of the Witwatersrand, Johannesburg.

FIJI ISLAND FOUNDER Describes Trials and Tribulations

FROM FAR-OFF Suva in the Fiji Islands, deep in the South Pacific, A.F.A. recently received an interesting letter from Warren Homiston, foreman of the iron and brass foundry of W. R. Carpenter & Co., Ltd. In his letter, part of which is printed below, Mr. Homiston describes some of the foundryman's problems in dealing with native labor, excessive moisture conditions, and difficulties of supply, as well as eagerness for information on modern methods of casting:

"Since 1939 there must have been a complete change in molding methods; floor, machine and stripping plate molding for mass production during the war period. I would like to know these things as I am out of touch with modern details and methods in this out-of-the-way place called Suva.

"I am foreman of an iron and brass foundry which covers cast iron alloys (ladle additions), gunmetal, bronzes, brasses, aluminum and babbit bearing metals. We use a 24-inch and a 14-inch cupola, the smaller being used for rush jobs and clearing away light castings while the floor is being filled with heavy jobs for the larger cupola. I make all the

cores and all the large sweeping jobs and any others of any large size, and any intricate molds.

"There are six molders in the shop, two laborers, one being the furnaceman, and at the moment there is only one other European in the shop besides myself, all the rest being of Fijian blood or half-cast. I certainly have my troubles with them. Our patternmaker is a Chinese whom I taught setting-out methods and blue-print reading.

Built in 1937

"The complete shop was built by me in 1937, there being cast iron molding boxes, two brass furnaces which are oil burning, a 14 ft. x 6 ft. x 6 ft. core oven, sand mill, rumblor and emery wheel. There are also two blowers, one large and one small for the corresponding cupolas.

"The foundry is situated alongside the harbor, a distance of ten feet, and what with the salt atmosphere and not being able to dig down more than a foot, this makes our job very hard. The climate here on this side of the island is nearly always wet, and we in Suva consider the two seasons to be the wet and the rainy. Of course, we do get

spells of beautiful weather sometimes.

"So you see, every time it rains the sand gets moist, so that when mixing it care is taken in dampening it after knocking out castings. I purposely black-wash a job that has to be turned all over because of the salt in the sand. You would think it would burn out, but if it does it is not enough to cope with the return of the salt into the sand.

"There is this problem: There is about 90 to 98 per cent humidity nearly all the time, and that is drawn into the blowers supplying the air for the cupolas. As I have read, this means greater consumption of coke and cooler metal, which is exactly what is happening, to the detriment of the castings.

"Are those self-feeding fluxes any good, and if they are, where can they be secured? Have you a method of pricing castings with and without cores? If any books are available on these problems, I am afraid it is going to be difficult to send money to America, the British government not allowing dollars to be bought for American goods except to permit holders, these being for essential goods, etc.

"If you write, air mail the letter. It will get here in two weeks, but a surface mail takes approximately three months."

AMERICAN FOUNDRYMAN

CHAPTER OFFICERS



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The Nock Fire Brick Co.
Cleveland
Secretary
Northeastern Ohio Chapter



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Whiting Corp.
New York
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Metropolitan Chapter



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Dodge Steel Co.
Philadelphia
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Philadelphia Chapter



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Chicago Refrort & Fire Brick Co.
Chicago
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Quad-City Chapter



F. B. Skeates
Link Belt Co.
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Vice-President
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Cincinnati Milling Machine Co.
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San Francisco Iron Foundry
San Francisco
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Northern California Chapter



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Lumen Bearing Co.
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Columbus, Ohio
Director
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G. L. White
Westman Publications, Ltd.
Toronto, Ont.
Secretary-Treasurer
Ontario Chapter



C. E. Schubert
University of Illinois
Urbana, Ill.
Director
Central Illinois Chapter

★ CHAPTER ACTIVITIES ★

news

Metropolitan

B. K. Price
Penton Publishing Co.
Chapter Reporter

WHILE PREDICTING a critical shortage of scrap under present government policy, E. C. Barringer, president and executive secretary, Institute of Scrap Iron and Steel, Washington, D. C., told members of the Metropolitan A.F.A. chapter, meeting on October 7 in the Essex

House, Newark, N. J., that he saw no chance for real improvement until collectors find it worthwhile to go out and bring in the scrap.

Further, he was far from optimistic concerning the possibility of obtaining any substantial amounts of overseas battle scrap. Much more of this is in the Pacific than in Europe, and the cost of moving scrap from the Far East is almost prohibitive. As for the European scrap, he explained, little is coming in, with the outlook not promising.

Discussing reasons for the present shortage, Mr. Barringer pointed out that inventories were greatly reduced during the war; with drives to meet current emergencies robbing the future. Auto graveyards are interested in the salvaging of parts, not scrap, the speaker advised, and little improvement can be looked for until automobile production gets going.

Mr. Barringer was the featured speaker of the meeting, devoted entirely to scrap and secondary metals. At the conclusion of his address, round tables on steel, iron and non-ferrous metals were held; discussion leaders were, respectively, A. B. Morrison, Atlas Foundry Co., Irvington, N. J.; R. A. Flinn, American Brake Shoe Co., Mahwah, N. J., and Dr. N. E. Woldman, Woldman Engineering Laboratories, Newark.

Michiana

H. B. Voorhees
Peru Foundry
Chapter Director

THE HISTORY and techniques of "Core Blowing" were related to 125 members and guests of Michiana A.F.A. chapter by L. D. Pridmore, International Molding Machine Co., Chicago, who was speaker of the evening for the October 1 meeting at the Whitcomb Hotel, St. Joseph, Mich.

Chapter Director Earl Byers, Sibley Machine & Foundry Co., South

Some highlights of the annual picnic of Michiana A.F.A. chapter at Christiana Country Club, Elkhart, Ind., September 21.



December 19

Twin City

Radisson Hotel, Minneapolis
CHRISTMAS PARTY

Oregon

Heathman Hotel, Portland
CHRISTMAS PARTY

December 20

Washington

Olympic Hotel, Seattle

December 21

Cincinnati District

Netherland Plaza Hotel
Cincinnati
CHRISTMAS PARTY

December 23

Northwestern Pennsylvania

Moose Club, Erie
CHRISTMAS PARTY

January 3

Mexico City

Barcelona 11, Second Floor

January 6

Metropolitan

Essex House, Newark, N. J.
F. G. SEFING
International Nickel Co.
Production of Sound Castings

Central Illinois

Jefferson Hotel, Peoria
H. C. WINTÉ
Worthington Pump & Machinery Corp.
Gates and Risers

Chicago

Chicago Bar Association
ROUND TABLE MEETING

Central Indiana

Hotel Antlers, Indianapolis
A. J. TUSCANY
Foundry Equipment Manufacturers Ass'n.
Future Responsibilities of the Foundry Industry

January 7

Michigan

LaSalle Hotel, South Bend, Ind.
KENNARD LANGE
Link-Belt Co.
Analysis of Foundry Mechanization

DECEMBER, 1946

CHAPTER MEETINGS

DECEMBER-JANUARY

January 9

Northeastern Ohio

Cleveland Club, Cleveland
MAX KUNIANSKY
Lynchburg Foundry Co.
NATIONAL OFFICERS & PAST
PRESIDENT NIGHT

St. Louis District

DeSoto Hotel, St. Louis
Plant Maintenance

January 10

Philadelphia

Engineers Club
W. B. GEORGE
R. Lavin & Sons, Inc.
Brass—Physical Property vs. Section Size

Eastern Canada-Newfoundland

Mount Royal Hotel, Montreal
H. M. ST. JOHN
Crane Co.
Methods of Control in Brass Foundry Melting

Southern California

Roger Young Auditorium, Los Angeles
D. W. BARRY
Minco Products Corp.

Wisconsin

Schroeder Hotel, Milwaukee
SECTIONAL MEETING

January 13

Cincinnati District

Engineering Society Headquarters
Cincinnati
R. L. LEE
General Motors Corp.
Human Relations

Texas

Blackstone Hotel, Fort Worth

Western Michigan

Hotel Schuler, Grand Haven
TOM BARLOW
Battelle Memorial Institute
Sensible Cupola Operation

January 14

Twin City

Curtis Hotel, Minneapolis
L. D. PRIDMORE
International Molding Machine Co.
Core Blowing

No. Illinois & So. Wisconsin

Faust Hotel, Rockford
R. A. CLARK
Electro Metallurgical Co.
Principles of Cupola Operations

Rochester

Seneca Hotel
C. A. SANDERS
American Colloid Co.
Modern Progress in Foundry Sand Practice

January 16

Canton District

Massillon Club, Massillon, Ohio
PROBLEM NIGHT

Detroit

Rackham Educational Memorial
GROUP MEETINGS

January 17

Birmingham District

Tutwiler Hotel, Birmingham, Ala.
N. J. DUNBECK
Eastern Clay Products, Inc.

January 20

Quad-City

Fort Armstrong Hotel
Rock Island, Ill.
C. A. SANDERS
American Colloid Co.
Foundry Sand Practice

January 23

Washington

Olympic Hotel, Seattle

COMING FOUNDRY CONFERENCES

February 13-14

Wisconsin

TENTH ANNUAL CONFERENCE

February 20-22

Birmingham District

Tutwiler Hotel, Birmingham, Ala.
FIFTEENTH ANNUAL CONFERENCE

February 28-March 1

Eastern Canada-Newfoundland

Royal York Hotel, Toronto
CANADIAN CONFERENCE



Refreshments were thoroughly dealt with at Michiana A.F.A. chapter's annual picnic on September 21 at the Christiana Country Club, Elkhart, Ind.

Bend, Ind., introduced the speaker.

Mr. Pridmore described early applications, in which the blower was used only on simple cores weighing not more than two pounds; development of vents, and experiments with varying air pressures. He concluded by advising the foundrymen to remember that: over venting does no harm, under venting does; sand control is very important, water and oil must be added with the utmost care; the best material available for the core room is the cheapest in the long run, when the high cost of scrap castings is taken into account.

sion period at the conclusion of his remarks demonstrated the intense interest of the foundrymen in his subject.

Speaker of the evening at the November 4 meeting of the chapter, held at the Jefferson Hotel, was A. F. Pfeiffer, Foundry & Pattern Div., Allis-Chalmers Manufacturing Co., Milwaukee, whose subject was "Casting Dimensional Stability."

The speaker presented a display of

models and patterns, and illustrated his remarks with slides. In addition to going into detail on his technical subject, Mr. Pfeiffer stressed the imperative need for more apprentice training programs, as the supply of patternmakers is diminishing while the demand is increasing. He also underlined the necessity for co-operation between engineer, patternmaker and foundryman—all working for a common cause, production of a commodity that meets the demands of the purchaser.

Saginaw Valley

J. J. Clark
General Motors Corp.
Chapter Director

NATIONAL OFFICERS' NIGHT launched Saginaw Valley chapter's 1946-47 season on October 3 at Fischer's Hotel, Frankenmuth, Mich.

A.F.A. National Vice-President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., and H. F. Scobie, A.F.A. educational assistant, were on hand for the occasion. Both addressed the foundrymen on the Association's National Education Program.

Speaker of the evening was National Director B. L. Simpson, National Engineering Co., Chicago, who discussed "The History and Development of the Foundry Indus-

During a pause at the October 7 meeting of Central Illinois A.F.A. chapter at the Jefferson Hotel, Peoria, Ill., Chapter Director F. W. Shipley, Caterpillar Tractor Co., Peoria, program chairman, exchanges observations with the speaker of the evening, A.F.A. National Vice-President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va.

(Photo courtesy Caterpillar Tractor Co.)

Central Illinois

C. H. Rockwell
Caterpillar Tractor Co.
Chapter Secretary

THE FIRST of the fall and winter programs of Central Illinois A.F.A. chapter was offered at the Jefferson Hotel, Peoria, Ill., on October 7, with attendance of more than 100 to hear A.F.A. National Vice-President Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., discuss "Foundry Control."

Mr. Kuniansky stressed the necessity of good control in all departments of the foundry, describing the results obtained through methods used in his own firm. An interesting and educational question and discus-



try." Mr. Simpson's illustrated lecture traced the story of metal castings from the days of several thousand years B. C. to the present.

No. Illinois & So. Wisconsin

H. J. Bauman
Ebaloy, Inc.
Chapter Secretary

ORIGIN AND HISTORY of the American dollar was the subject of W. H. Stevenson, William H. Stevenson Co., Chicago, speaker of the evening at the October 8 meeting of Northern Illinois and Southern Wisconsin A.F.A. chapter in the Faust Hotel, Rockford, Ill.

Canton District

C. B. Williams
Massillon Steel Castings Co.
Chapter Secretary

SAND was the subject of the technical session at the regular meeting of Canton District A.F.A. chapter in the Sue Ming Restaurant, Canton, Ohio, on October 10. Chapter Chairman I. M. Emery, Massillon Steel Castings Co., Massillon, Ohio, presided and 85 members and guests were in attendance to hear the discussion by Charles Schureman, F. E.

National Officers' Night at Saginaw Valley A.F.A. chapter opened the season October 3 at Fischer's Hotel, Frankenmuth, Mich. Inset, top left, A.F.A. National Vice-President Max Kuniansky (seated), Lynchburg Foundry Co., Lynchburg, Va., and Chapter Chairman J. F. Smith, General Motors Corp., Saginaw, Mich. Speaker of the evening was National Director B. L. Simpson (at rostrum), National Engineering Co., Chicago.

Schundler, Incorporated, Joliet, Ill.

Mr. Schureman discussed molding and core sands and practices, considering in detail grain size and distribution, synthetic mixes, milling time, moisture content, drying temperatures for core sands, and many other phases of the subject. His remarks were followed by a lively discussion under direction of Chairman Emery.

New England

M. A. Hosmer
Hunt-Spiller Manufacturing Corp.
Association Reporter

GUEST SPEAKER of the evening at the regular monthly meeting of the New England Foundrymen's Association, October 9 in the Engineer's Club, Boston, was H. J. Williams, New Jersey Silica Sand Co., Millville, N. J., who discussed "Mining and Processing of Molding Sand."

Uniformity Stressed

The speaker displayed an unusually interesting collection of slides, which included views of a thoroughly equipped sand control laboratory, and stressed the importance of uniformity in sand grading and of maintaining the latest equipment. He described the preparation of various types of sand, from the mining to loading the finished product for delivery, and considered chemical and physical properties of sand.

At a brief business meeting held before the technical session, the foundrymen heard a report by the chairman of the group pig iron committee, R. F. Harrington, Hunt-Spiller Manufacturing Corp., Boston.

Wisconsin

SECTIONAL MEETINGS made up the technical program for the October 11 meeting of Wisconsin A.F.A. chapter, held at the Schroeder Hotel, Milwaukee, and attended by 254 members and guests.

W. R. Jaeschke, Whiting Corp., Harvey, Ill., addressed the malleable group on "Duplex Melting." He accompanied his discussion with a number of excellent slides, and went into further details on various aspects in response to questions from his audience during the general question and answer period.

The pattern group heard H. C. Swanson, Arrow Pattern & Foundry Co., Chicago, discuss "Pressure Cast Aluminum Cope and Drag Patterns," as Harry Arneson, Spring City Pattern Works, Inc., Milwaukee, sat as chairman. Mr. Swanson explained each step in the manufacture of the aluminum plates, displaying models to clarify certain procedures. He also considered pressure cast aluminum core boxes.

Members of the steel group were highly interested in the talk on "Ex-





othermic Material for Foundry Use*" presented by Michael Bock II, Unexcelled Chemical Corp., Cambridge, Mass. Chairman of the session was H. A. Ziebell, Crucible Steel Casting Co., Milwaukee. Mr. Bock considered many phases of exothermic reactions in risers, such as, greater metal yield, reduction in riser size, denser metal, elimination of bore cracks, control of the chemical reaction, and the size of castings produced with the use of such materials.

*See *Exothermic Materials*, C. G. LUTTS, J. P. Hickey and Michael Bock II, Page 71, *AMERICAN FOUNDRYMAN*, August, 1946.

Northeastern Ohio

W. G. Gude
The Foundry
Chapter Reporter

SIMULTANEOUS TECHNICAL sessions on cupola operation and patternmaking were held at the October 11 meeting of Northeastern Ohio A.F.A. chapter in the Cleveland Club. T. E. Barlow, Battelle Memorial Institute, Columbus, Ohio, addressed the former group, and A. J. Tuscany, secretary, Foundry Equipment Manufacturers Association, Cleveland, the latter.

Approximately 200 members and guests were in attendance, with Chapter President H. J. Trenkamp, The Ohio Foundry Co., Cleveland, presiding.

Bed Height

Mr. Barlow, elaborating on the need for constant vigilance on the part of the cupola supervisor, discussed various factors which may prevent uniform conditions within the cupola from day to day. The bed, he advised, should be measured not only by its height, but also by the length of time it has burned; for correct comparison, it should be measured at the same time each day. Burned lining will affect the bed height, and should be taken into consideration.

The speaker recommended that, since air is the principal material

A few of the many chapter members and dignitaries seated at the Philadelphia - Chesapeake - Metropolitan Regional Conference luncheon held in Philadelphia recently.

entering the cupola, a check should be taken to determine if the proper amount is introduced where it is required. His remarks were followed by a general discussion covering many phases of current practice.

Mr. Tuscany, addressing the pattern group, stressed the important place of the patternmaker in the industry, and suggested that the pattern industry should help foundries advance by supplying high quality patterns from which good castings can be made. Pattern shops, he observed, should improve their equipment and better their housekeeping.

Some 40 members of the chapter patternmaking division heard Mr. Tuscany's talk and participated in the general discussion that followed under direction of Ed Pierie, Motor Pattern Co., Cleveland.

Western Michigan

K. C. McCready
Muskegon Piston Ring Co.
Chapter Reporter

ANNUAL OUTING of Western Michigan A.F.A. chapter, which was held in August, was the best attended and the most successful financially in chapter history, it was reported as the chapter opened a new season, October 14 at the Schuler Hotel, Grand Haven, Mich. Attending the meeting were 95 members and guests; and Chapter Chairman Rudolph Flora, Clover Foundry Co., Muskegon, Mich., presided.

Technical session of the evening was devoted to personnel problems, discussed by Frank Rising, Automotive & Aviation Parts Manufacturers, Inc., Detroit. He was introduced by R. I. Mason, secretary and manager, Muskegon Manufacturers' Association, Muskegon.

Eastern Canada-Newfoundland

Robert Lepine
Crane, Ltd.
Chapter Reporter

CHAPTER MEMBERSHIP is at an all-time high for Eastern Canada and Newfoundland A.F.A. chapter, Chapter Director Robert Stott, Canadian Car & Foundry Co., Montreal, reported at the first meeting of the season, October 11 in the Mount Royal Hotel, Montreal. An excellent attendance of 165 members and

guests turned out, and Chapter Chairman Henri Louette, Warden King, Ltd., Montreal, presided.

A.F.A. Technical Director S. C. Massari, Chicago, was speaker of the evening on "Cupola Operation."

Mr. Massari pointed out the importance and versatility of the cupola and stressed the necessity for rigid control of charge components and operating conditions. One variable—air volume—can be regulated by the most modern foundry, he explained, through proper installation of a pitot tube in the wind line, to obtain an accurate measure of the volume of air being used.

Uniformity of Operation

The speaker went into detail in regard to uniformity of operation, proper selection of refractories for cupola linings, tuyeres and other aspects of his subject.

During the business portion of the evening, Mr. Stott reported for his committee the registration of more than 40 new members, bringing total chapter membership to a record 332 toward the goal of 350 that had been set.

Presenting the report of the educational committee, its chairman, G.

E. Tait, Dominion Engineering Works, Lachine, Que., described close contact with the staff of the Montreal Technical School, of that city, in relation to the foundry course being presented at the school. Mr. Tait said that the committee is laying stress on training of young men toward supervisory positions, and that the enrollment for this year is most encouraging.

Twin City

Alexis Caswell
Manufacturers' Association
of Minneapolis
Chapter Secretary-Treasurer

HUMANICS IN INDUSTRY made an engrossing story, as unfolded by Dr. R. L. Lee, General Motors Corp., Detroit, before the October 10 meeting of Twin City A.F.A. chapter at the Curtis Hotel, Minneapolis.

Humanometer

Citing the importance of precision tools in the development of American industry, Dr. Lee commented, "No one has yet invented a 'Humanometer' with which to measure the human characteristics; the

Officers and guest speakers at the October 14 meeting of Western Michigan A.F.A. chapter at the Schuler Hotel, Grand Haven, Mich. Left to right: standing, Chapter Treasurer Arthur Green, Dake Engine Co., Grand Haven; Vice-Chairman C. H. Cousineau, West Michigan Steel Foundry Co., Muskegon, Mich.; Secretary V. A. Pyle, Pyle Pattern & Mfg. Co., Muskegon Heights, Mich. Seated, Chapter Chairman Rudolph Flora, Clover Foundry Co., Muskegon; Frank Rising, Automotive & Aviation Parts Manufacturers, Inc., Detroit, and R. I. Mason, Muskegon Manufacturers' Ass'n., Muskegon.





breadth, strength, hardness, elasticity, crystallization and boiling points of the individuals who compose our industrial organizations."

He went on to list four pertinent facts regarding human behavior: everyone is different, the only one of his kind; most people are what they are because they cannot change, or be changed much; no one individual is the same all the time; everyone is proud of being different.

Cincinnati District

E. F. Kindinger
Williams & Co., Inc.
Chapter Secretary

PLANT VISITATION was the program for the October 14 meeting of Cincinnati District A.F.A. chapter, and 170 foundrymen under the leadership of Chapter Chairman J. S. Schumacher, Hill & Griffith Co., Cincinnati, inspected the facilities of the Cincinnati Milling Machine Co., of that city.

Following the tour of the plant, which began in mid-afternoon, and dinner, the members and guests saw color motion pictures of plant operations.

Detroit

C. J. Rittinger
American Car & Foundry Co.
Chapter Reporter

THE FULL AUDIENCE gave its attention to a lively one-hour question and answer period at the conclusion of the formal program for the October 17 meeting of Detroit A.F.A. chapter at the Rackham Educational Memorial, Detroit. One of the largest crowds in chapter history, 150 members and guests, was on hand for the technical presentation of the evening, which included discussions by Dr. R. L. Lee and H. T. Gierck, both of General Motors Corp., Detroit, and a motion picture, "The Experiment," presented through courtesy of the same firm and in which Dr. Lee and H. G. Weaver, General Motors customer research staff, play the major roles.

Foundrymen inspect the facilities of the Cincinnati Milling Machine Co., Cincinnati, as Cincinnati District A.F.A. chapter devotes its October 14 meeting to plant visitation.

AMERICAN FOUNDRYMAN

In his discussion, Dr. Lee analyzed the human characteristics bearing on labor-management relationship, and stressed the importance of man-to-man considerations in the conduct of business. Mr. Gierck described the grievance procedures used by his firm, and traced the progress of a typical case from inception to disposition, emphasizing the importance of prompt and fair action.

Birmingham District

J. P. McClendon
Stockham Pipe Fittings Co.
Chairman, Publicity Committee

ONE OF THE LARGEST CROWDS in the history of Birmingham District A.F.A. chapter turned out on October 18 at the Tutwiler Hotel, Birmingham, Ala., to hear W. W. Levi, Lynchburg Foundry Co., Lynchburg, Va., discuss "Cupola Operations and Control."

Chapter Chairman T. H. Benners, Jr., T. H. Benners & Co., Birmingham, presided at the dinner and introduced the coffee speaker, L. F. Jeffers, Trustees Loan & Discount Co., Birmingham. Mr. Jeffers described an industrial survey made of the Birmingham area and the prospects for encouraging new industries there.

Cupola Operation

At the technical session, Chapter Vice-Chairman W. E. Jones, Stockham Pipe Fittings Co., Birmingham, who serves as program chairman, introduced Mr. Levi. The speaker highlighted a number of vital aspects of cupola operation, illustrating his remarks with slides.

He stressed that exact knowledge of the composition and behavior of raw materials is one of the first requirements of successful operation. Accurate weighing of all components of the charge is also vital, the speaker stated, for promotion of uniformity not only in carbon content, but in all other elements involved.

Also considered were details of

Right—These speakers presented an abundance of interesting and informative papers at the Philadelphia-Chesapeake-Metropolitan Regional Conference held November 1 and 2 in Philadelphia.

DECEMBER, 1946





Some of the principals of one of the most successful open meetings in the history of Birmingham District A.F.A. chapter, held October 18 at the Tutwiler Hotel, Birmingham. Left to right: L. F. Jeffers, Trustees Loan & Discount Co., who presented the coffee talk; Chapter Secretary-Treasurer F. K. Brown, Adams, Rowe & Norman, Inc., and Chapter Chairman T. H. Benners, Jr., T. H. Benners & Co., all of Birmingham; W. W. Levi, Lynchburg Foundry Co., Lynchburg, Va., speaker of the evening, and Chapter Vice-Chairman W. E. Jones, Stockham Pipe Fittings Co., Birmingham.

carbon control, use of various types of coke, and mechanical charging of the cupola.

Quad City

C. R. Marthens
Marthens Co.
Chapter Secretary-Treasurer

INTERESTING INFORMATION AND advice from a foundry veteran were passed along to younger foundrymen at the October 21 meeting of Quad City A.F.A. chapter in the Fort Armstrong Hotel, Rock Island, Ill. August Christen, Arcade Manufacturing Co., Freeport, Ill., was speaker of the evening, and approximately 85 members and guests were present to hear his informal reminiscences from many years in the foundry industry.

Central Ohio

D. E. Krause
Battelle Memorial Institute
Chapter Reporter

BASIC SHORTCOMINGS in "Core Room Practice" were graphically detailed for the technical session of the October 28 meeting of Central Ohio A.F.A. chapter at the Chittenden Hotel, Columbus, by L. P. Robinson, Werner G. Smith Co., Cleveland.

The speaker introduced his remarks with the observation that the

belief of many foundrymen that they had secrets unknown to other members of the industry greatly hindered the much-needed exchange of knowledge necessary to keep the foundry industry abreast of modern developments. He urged that foundrymen attend local A.F.A. chapter meetings and participate in discussions, which afford an excellent opportunity to obtain solutions to their problems.

Mr. Robinson then went on to discuss certain fundamentals common to all core room practices, which he enumerated and discussed in detail with well chosen examples.

Recommendations Made

He made a number of definite recommendations: 1) Use proper sand as a base, poor sand requires an excessive amount of binder and produces poor cores; 2) Cereal binder is very useful, but an excess is to be avoided; 3) Oil-sand ratios should be based on weight, not on volume measurements of dubious accuracy; 4) Use proper mixing cycle for type of mixture and type of batch; 5) Use baking temperature recommended by manufacturer of the core oil and bake completely, but do not burn the core; 6) Use dry sand to obtain proper control of moisture content; 7) Vent the mold properly to carry off gases from the

core vents; 8) Inspect cores carefully before placing in mold—it is cheaper to scrap a defective core than a defective casting.

Chesapeake

J. A. Reese
Koppers Co. Inc.
Chapter Reporter

ACTUAL OPERATION of a bench type core blower supplemented the discussion of "Core Blowers and Sand Mixtures" by J. Howard Ware, Redford Iron & Equipment Co., Detroit, at the October 25 meeting of Chesapeake A.F.A. chapter in the Engineers Club, Baltimore, Md.

Core blowing with the cartridge, bench type blower, the speaker said, is ideally suited for mass production of plain and intricate cores. Each core box is an individual problem, since the positioning of the necessary vents in either wood or metal boxes directs the flow of sand, he pointed out.

In discussing venting, Mr. Ware explained that the positioning of the vents is determined by the fineness of the sand, wear on core boxes is caused by improper venting and several small vents are more advantageous than one large one. He concluded with the statement that an air blown core is stronger and coarser in the center than a hand-rammed one, since fine grains are blown to the outside, or surface.

Chapter Vice-Chairman W. H.

Chapter Vice-Chairman A. V. Martens (left), Pekin Foundry & Manufacturing Co., Pekin, Ill., and speaker of the evening A. F. Pfeiffer, Allis-Chalmers Manufacturing Co., Milwaukee, look over one of the displays at the November 4 meeting of Central Illinois A.F.A. chapter in the Jefferson Hotel, Peoria, Ill.

(Photo courtesy Caterpillar Tractor Co.)





Holtz, American Brake Shoe Co., Baltimore, acted as technical chairman of the meeting and introduced the speaker. A prolonged general discussion following Mr. Ware's remarks, demonstrated the interest of those present in the subject.

Northwestern Pennsylvania

J. E. Gill
Lake Shore Pattern Works
Chapter Reporter

FOUNDRY SAND PROBLEMS were analyzed for 150 members and guests attending the October 28 meeting of Northwestern Pennsylvania A.F.A. chapter at the Moose Club, Erie, Pa., by Harry W. Dietert, Harry W. Dietert Co., Detroit.

Sand Control

The speaker, presenting a scientific approach to the problems involved when molten metal is poured into sand, discussed sand control, go-

Scenes from Northern California A.F.A. chapter's annual stag outing at Mira Vista Country Club, Berkeley, October 10.

(Photos courtesy S. D. Russell, Phoenix Iron Works)

ing into detail in regard to various materials used to counteract oxidizing of the metal.

Chapter Chairman E. M. Strick, Erie Malleable Iron Co., Erie, presided at the meeting, as well as at a session of the chapter Directors which was held before the larger gathering.

Old Timers Night

The Directors discussed plans for the chapter's forthcoming "Old Timers Night." Chapter Director J. A. Shuffstall, National Erie Corp., Erie, is chairman of the committee in charge of arrangements for the event.

R. J. Harding, Pickands-Mather Co., Erie, has taken over leadership of the reservations committee for chapter meetings. He replaces Ralph

Wedgwood of the same firm, who was transferred to St. Louis.

Southern California

E. B. Allen
H. B. McGowan Co.
Chapter Reporter

WELL OVER ONE HUNDRED members welcomed A.F.A. National President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis, and National Secretary-Treasurer W. W. Maloney, Chicago, to the October 18 meeting of Southern California A.F.A. chapter in Roger Young Auditorium, Los Angeles.

This first visit of a National President to the chapter in the past five years was an occasion of enthusiasm for foundrymen in the area. Both



During the visit of A.F.A. National Officers to Southern California A.F.A. chapter, this group gathered at the October 18 meeting in Roger Young Auditorium, Los Angeles: left to right, W. W. Maloney, National Secretary-Treasurer; National President S. V. Wood, Minneapolis Electric Steel Castings Co., Minneapolis; Chapter President W. D. Emmett, Los Angeles Steel Castings Co., Los Angeles; speakers of the evening, R. B. Hood, special agent, Federal Bureau of Investigation, and R. J. DeRoche, Carborundum Co., Niagara Falls, N. Y.

Mr. Wood and Mr. Maloney addressed the gathering briefly, detailing certain activities of the Association, its value to the foundry industry and plans for the immediate future.

Grinding Film

Technical presentation of the evening was a motion picture, "Higher Production, Greater Precision Through Grinding," through courtesy of Carborundum Co., Niagara Falls, N. Y., with comments by R. J. DeRoche, of that firm.

As a diversion from foundry affairs, R. B. Hood, special agent, Federal Bureau of Investigation, gave a coffee talk earlier in the evening. He discussed operations of his organization in dealing with many types of criminal operations.

Chicago

G. J. Biddle
Illinois Clay Products Co.
Chapter Reporter

FIRST ROUND TABLE MEETING of the new season for Chicago A.F.A.

chapter was held November 4 at the Chicago Bar Association.

"Control of Carbon in the Cupola" was the subject for the gray iron group, and speakers were John Gellert, Nichol-Straight Foundry Co., and H. G. Haines, Howard Foundry Co., both of Chicago, with H. K. Briggs, Miller & Co., Chicago, as chairman.

The malleable session heard Kenny Smith, Chicago Malleable Castings Co., of that city, present a discussion on "Gates and Risers," while Cecil Semrau, Illinois Malleable Iron Co., Chicago, served as chairman.

Magnesium Panel

Oscar Blohm, Hills-McCanna Co., and H. E. Ferguson, Acme Aluminum Foundry Co., both of Chicago, headed the program for the non-ferrous meeting as, respectively, speaker and chairman. Magnesium was the subject.

"Mechanism of Stress Formations in Steel" was the subject of discussion for the steel group, with C. F. Christopher, Continental Foundry &

Machine Co., East Chicago, Ind., as speaker, and F. S. Sutherland, of the same firm, in the chair.

Texas

W. H. Lyons III
Hughes Tool Co.
Chapter Reporter

FEATURES of the Texas A.F.A. chapter meeting of October 25 in the Rice Hotel, Houston, were a coffee talk by I. D. Richardson and a technical paper, "Better Castings for the Oil Industry," by John Sandberg, Emsco Derrick & Equipment Co.

Author Speaks

Mr. Richardson, only man to hold commissions in the Army and Navy simultaneously and co-author of a current best seller, "An American Guerrilla in the Philippines," related many of his experiences behind Japanese lines. He touched lightly on the grimmer side of battle, and emphasized the humorous incidents.

The need for better liaison between the foundry and the customer was stressed by Mr. Sandberg in the technical presentation of the evening. The speaker pointed out that foundrymen must supply the customer with information regarding design and specifications suitable to the production of good castings. This point Mr. Sandberg illustrated very well with examples.

AMERICAN FOUNDRYMAN

In figuring the cost of x-rays

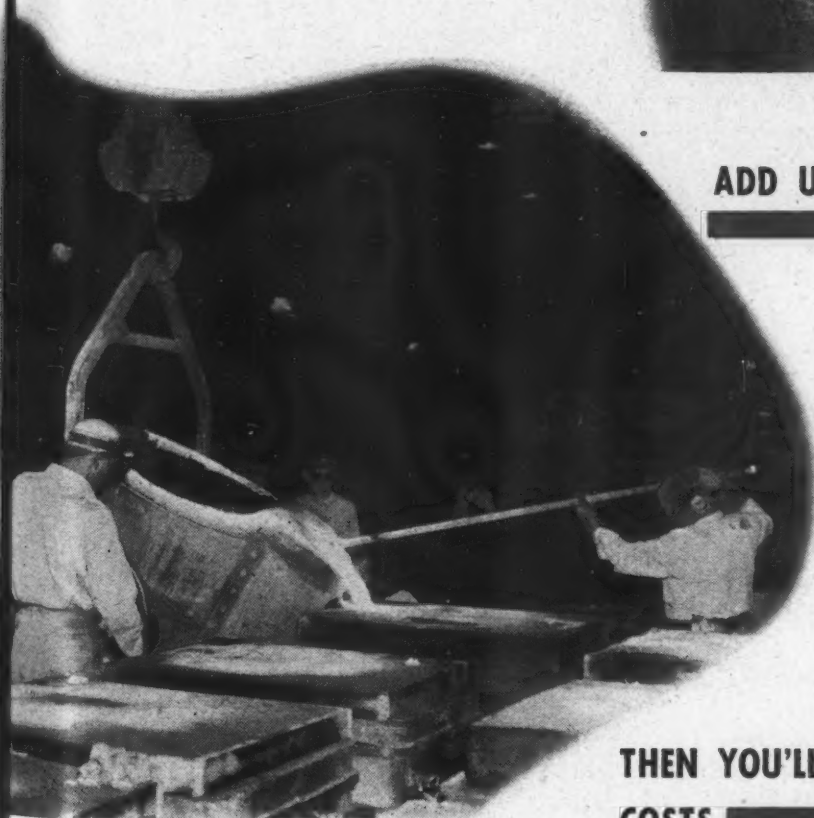
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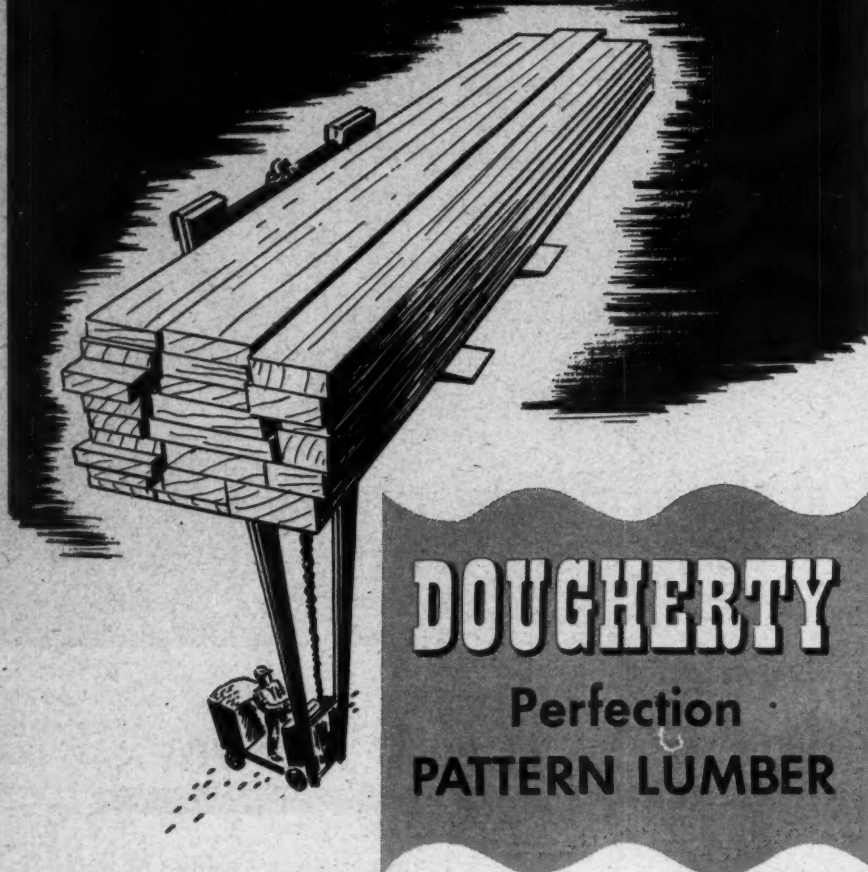
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LUMBER COMPANY

CHICAGO

(Continued from Page 67)

Rock Island, Ill., with E. L. LaGrelus, American Steel Foundries, East Chicago, Ind., in the chair.

Conference Dinner

Clifton Utley, well known radio commentator and news analyst, was the principal speaker at the banquet held Thursday evening. Conference Chairman A. W. Gregg, Whiting Corp., Harvey, Ill., was acting chairman at this affair.

Mr. Utley started his commentary with a few brief, but factual, remarks concerning the coal strike and then began his address, "Two Worlds." The speaker emphasized the important roles that the United States and Russia are playing in present day world-wide affairs. The need for the two countries to work in harmony and peace was related and the manner in which this could be accomplished was outlined by the radio speaker.

On Friday morning, at the final pattern group gathering, V. J. Sedlon, Master Pattern Co., Cleveland, pointed out that permanent mold making can be logically undertaken by patternmakers because they have the necessary background and allied experience, as he spoke on "Permanent Molds and Equipment." H. K. Swanson, Swanson Pattern & Model Works, Chicago, was chairman.

A permanent mold, Mr. Sedlon stated, might be called a pattern in reverse, and its manufacture requires a knowledge of gating, venting, risering, etc. He illustrated types of permanent mold through slides and considered manual and air-cylinder type operation.

Friday morning at the steel session, E. J. Wellauer, Falk Corp., Milwaukee, addressed the gathering on "Hardenability of Steel Castings." By means of a number of slides he explained the term hardenability; what it means to steel foundrymen and its application to various types of commercial steel being produced today.

R. E. Kerr, Pettibone Mulliken Corp., Chicago, acted as chairman for this group.

The last malleable session, held

(Continued on Page 90)

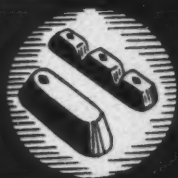
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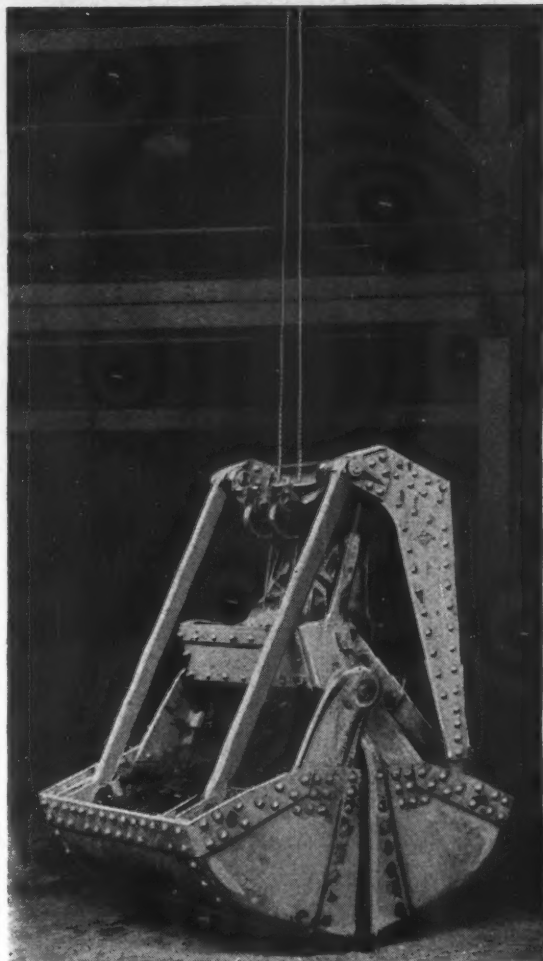


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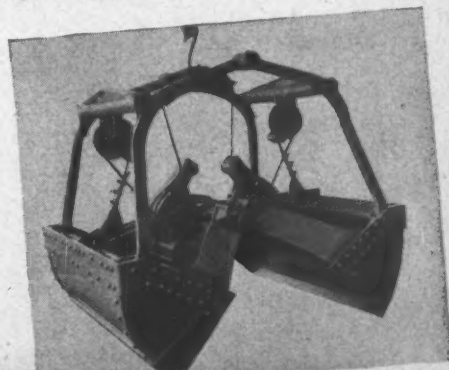
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BLAW-KNOX BUCKETS

CHICAGO

(Continued from Page 86)

the same morning, heard W. R. Jaeschke and C. R. Taylor, both of Whiting Corp., on the subject of "Modern Malleable Melting and Annealing," and C. C. Lawson presided.

Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, handled a subject vital to non-ferrous foundrymen

in his discussion of "Causes of Porosity in Aluminum Castings—How to Avoid It." He went into considerable detail of degassing with chlorine and nitrogen, considering the relative merits of each treatment with specific references to various tests and production experiences, and recommended chlorine as generally most effective.

Chairman of the meeting was W. B. George, who also presided at the following session, when F. S. Brewster, Dow Chemical Co., Bay City, Mich., focused the non-ferrous

foundrymen's attention on "Sand and Its Importance in Non-Ferrous Casting Production."

After pointing out that many failures are attributed to sand, although actually due to other factors which could be determined by more careful check, the speaker listed properties of sand and aspects of sand control most important to prevention of failures.

Two gray iron discussions, on "Sand Control," by G. W. Anselman, Goebig Mineral Supply Co., Chicago, and "Binders," by A. C. Den Breejen, Hydro-Blast Corp., of the same city, concluded the technical program for that group. Chairmen were, respectively, H. M. St. John and C. E. McClure, both of Crane Co., Chicago.

At Friday's luncheon, presided over by Chicago chapter Chairman L. H. Hahn, Earl Shaner, president, Penton Publishing Co., Cleveland, took the conferees on a trip "Around the World in 40 Minutes." He described economic and social conditions in other nations as he had found them during an inspection tour as a member of the Pauley Reparations Commission.

Dr. O. W. Eschbach, Dean of the Institute of Technology, Northwestern University, then delivered the closing remarks of the conference. Education, he said, looks to the future—as the foundry looks to the future—and new school buildings, now in the planning, will certainly include enlarged facilities for instruction in foundry technology.

The speaker explained the history of technical education is a history of crises, such as the present critical shortage of engineering graduates. However, he pointed out that contacts made with students by industries stimulate the interest of the student and influence his choice of a career. For that reason, it is advisable for associations, such as A.F.A., to popularize the opportunities of the foundry field.

On Friday afternoon, the second general session, concerned with core blowing, wound up the technical program. H. A. Forsberg, Continental Foundry & Machine Co., was in the chair, with R. P. Schauss, National Malleable & Steel Castings Co., Cicero, Ill., as co-chairman.

Speakers were A. W. Magnuson,

(Concluded on Page 93)

AMERICAN FOUNDRYMAN

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Beg Your Pardon

ASSOCIATION MEMBERS, especially those of the Quad-City and Birmingham District A.F.A. chapters, are entitled to an explanation in regard to a picture which appeared on the "Chapter Officers" page of AMERICAN FOUNDRYMAN for October, 1946.

The accompanying caption read: "W. E. Jones, Stockham Pipe Fittings Co., Birmingham, Ala., Vice-Chairman, Birmingham District Chapter." This identification, however, was in error, since the individual shown was W. E. Jones, American Steel Foundries, Bettendorf, Iowa, a Director of Quad-City A.F.A. chapter.

AMERICAN FOUNDRYMAN regrets any inconvenience or embarrassment caused the Messrs. Jones, and presents, herewith, properly identified cuts of our two chapter leaders.



W. E. Jones
Stockham Pipe Fittings Co.
Birmingham, Ala.
Vice Chairman
Birmingham District Chapter



W. E. Jones
American Steel Foundries
Bettendorf, Iowa
Director
Quad-City Chapter

DECEMBER, 1946

Scrap Pile or Shipping Room?

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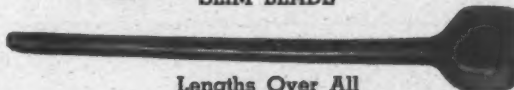
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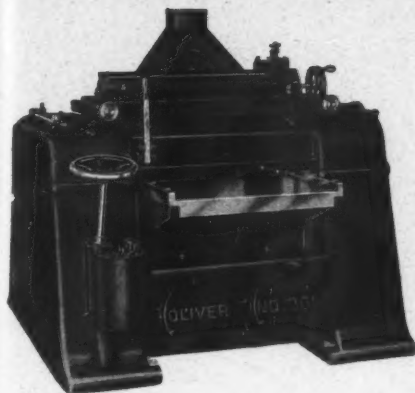
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**AMERICAN FOUNDRYMEN'S
ASSOCIATION**

222 W. Adams St., Chicago 6

CHICAGO

(Continued from Page 90)

Champion Foundry & Machine Co., Chicago, on "Sands for Core Blowing," L. D. Pridmore, International Molding Machine Co., of the same city, on "Core Blowing Equipment," and Zigmond Madacey, Caterpillar Tractor Co., and Chairman, Central Illinois A.F.A. chapter, on "Pattern Equipment for Core Blowing."

During the question and general discussion period, led by Mr. Schauss, the foundrymen took full advantage of the opportunity to obtain answers to their own shop problems from the panel of speakers. Some of the points highlighted in this phase of the session were properties of sand required for core blowing; facing of core boxes, steel predominates, but many other metals are also in use; sagging of cores; venting of core boxes; design of core boxes, and moisture content of sand.

STATEMENT OF OWNERSHIP

Statement of the ownership, management, circulation, etc., required by the acts of Congress of August 24, 1912, and March 3, 1933, of AMERICAN FOUNDRYMAN, American Foundrymen's Association, published monthly at Chicago, Ill., for October 1, 1946. State of Illinois, County of Cook, ss. Before me, a notary public in and for the state and county aforesaid, personally appeared Wm. W. Maloney, who, having been duly sworn according to law, deposes and says that he is the Editor of the AMERICAN FOUNDRYMAN, American Foundrymen's Association, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, to-wit: 1—That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Foundrymen's Association, Inc., Chicago, Ill.; Editor, Wm. W. Maloney, Chicago, Ill.; Managing Editor, G. R. Buhler, Chicago, Ill.; Business Managers, None. 2—That the owner is American Foundrymen's Association, Inc., not for profit; stock, none. Principal Officers: S. V. Wood, President, Minneapolis Electric Steel Casting Co., Minneapolis, Minn.; Wm. W. Maloney, Secretary-Treasurer, Chicago, Ill. 3—That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4—That the two paragraphs next above, giving the names of the owners, stockholders, and the security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. Wm. W. Maloney, editor. Sworn to and subscribed before me this 1st day of October, 1946. (Seal) Helen Brenner, notary public. (My commission expires Jan. 9, 1947.)

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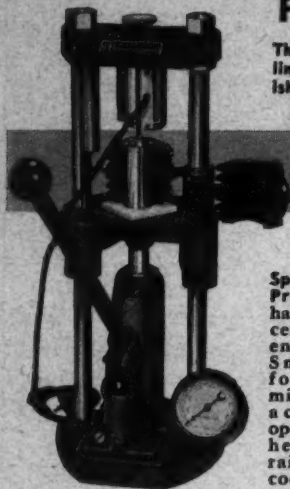
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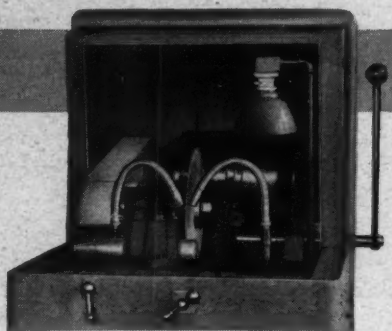
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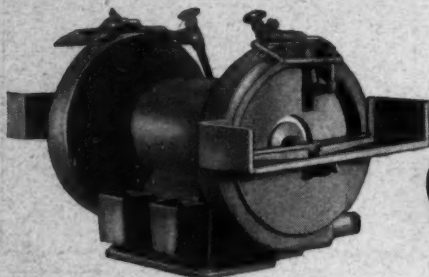
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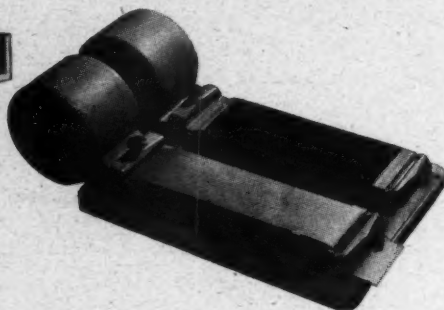
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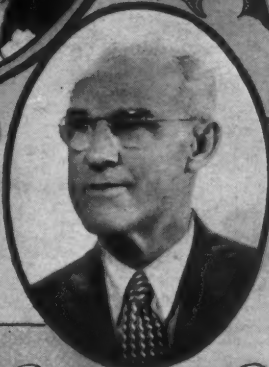
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